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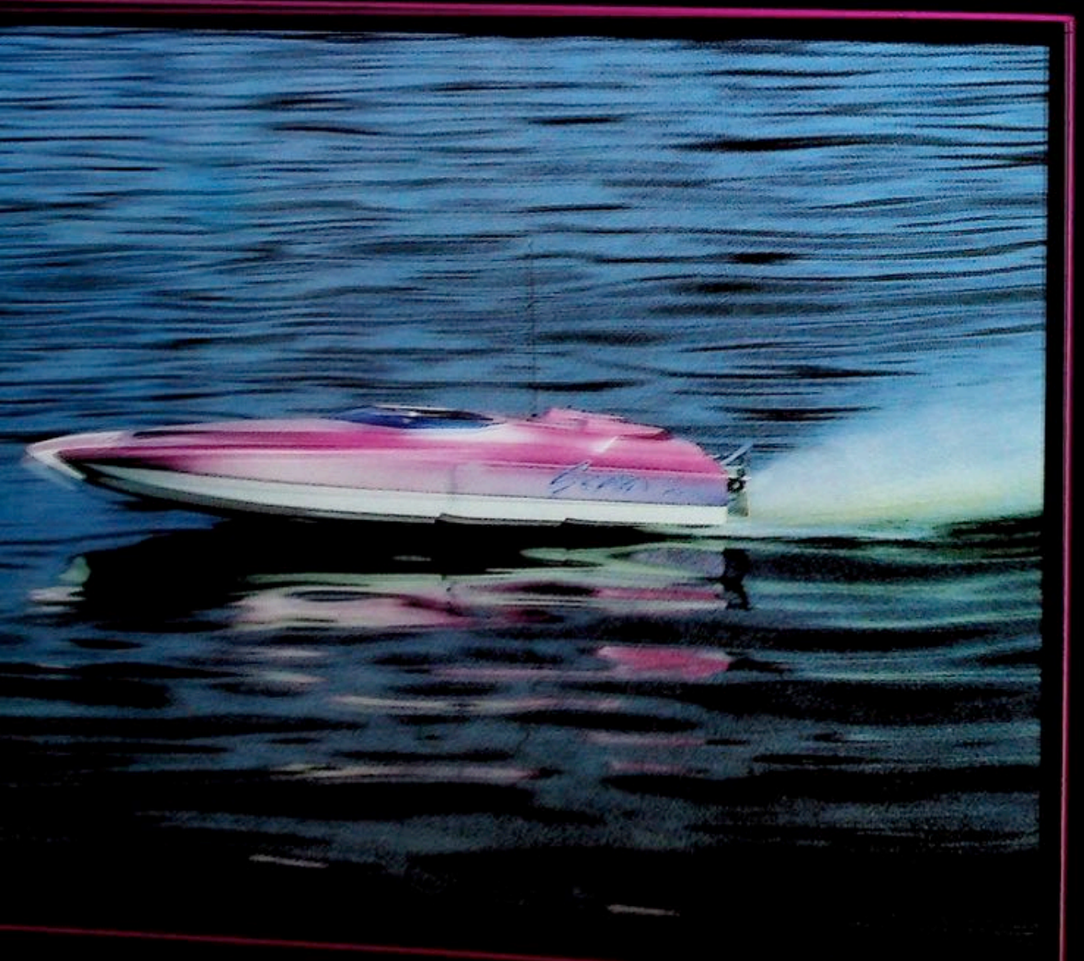

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CONTENTS

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SUMMER 1990
VOLUME 4, NUMBER 12

CORPORATE OFFICE:
898 WEST SIXTEENTH STREET
NEWPORT BEACH, CA 92663
714 645-8830

COVER: Colorful, full-scale unlimited; "Mr. Pringle's," shares the spotlight with the stately Hobby Lobby/Graupner "Miramare" and the speedy Dumas "Hotshot Sprint 35." Full-scale photography by APBA's Jim Vota, "Miramare" by Barney Kemter, and "Hotshot" by Jerry Dunlap. More details on all in some of this issue's articles.

DEPARTMENTS

CAP'N'S LOG, *Bill Northrop*.....6
BOOK REVIEW, *Peter Shreeves*.....9
RADIO WAVES, *Eloy Marez*.....21
STRICTLY SAIL, *Rod Carr*.....28
SHIP'S STORE,.....52
R/C POWER BOATS, *Jerry Dunlap*.....62

FEATURES

INNOVATIVE SAILBOAT DESIGN, *Francis Reynolds*.....25
R/C YACHT-CAM, *William Whitten*.....40
HISTORY OF GOLD CUP RACING, *John Gill*.....46
MODEL BOATS AT CALGARY EXPO, *Al Hobbs*.....64

SURVEYS

ACE R/C NAUTICAL COMMANDER RADIO, *Stu Richmond*.....22
HOBBY LOBBY/GRAUPNER "MIRAMARE", *Barney Kemter*.....33
HOBBY DYNAMICS' "CESA 1882", *Jerry Dunlap*.....36
DUMAS "HOTSHOT SPRINT 35", *Jerry Dunlap*.....60

CONSTRUCTION

"MARA"—AN R/C KETCH, *Walt Musciano*.....33

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For the past five years, you have had to do without a true modeler's (spelled *product consumer's*) sport and hobby show; a show where you can meet and talk with the manufacturers and importers of the model products you use; a show where you can even buy some of those products directly from the exhibitor's booth, sometimes at special prices, if they choose to sell; a show where you can enter your latest pride and joy in free static model competition for trophies and/or merchandise prizes; a show where you can sell and swap your junk for someone else's treasure; a show where you'll see live indoor R/C demonstrations; a show where you'll meet many of your modeling buddies from near and far because they'll be there for the same reasons.

Well, folks, this, your favorite style of model show, is coming back to your area! On Friday, Saturday, and Sunday, October 5, 6, and 7, 1990, International Modeler Shows (IMS), which produces the outstanding Pasadena and Atlanta R/C model sport and hobby shows, will be coming to the MECCA Center in Milwaukee, Wisconsin, just 90 miles up the west side of Lake Michigan from Chicago, Illinois. Watch this and other model publications for all the details.

See ya there!

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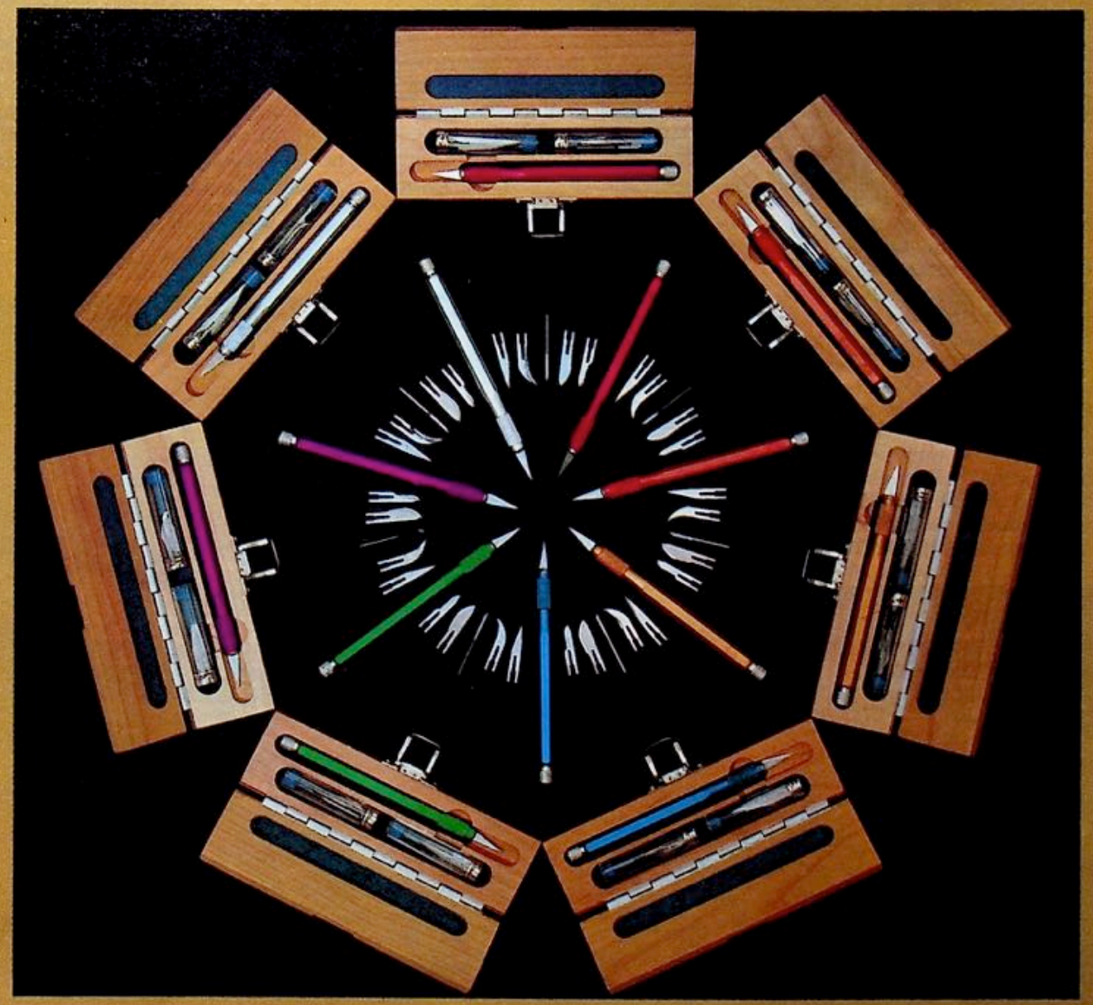

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CAP'N'S LOG

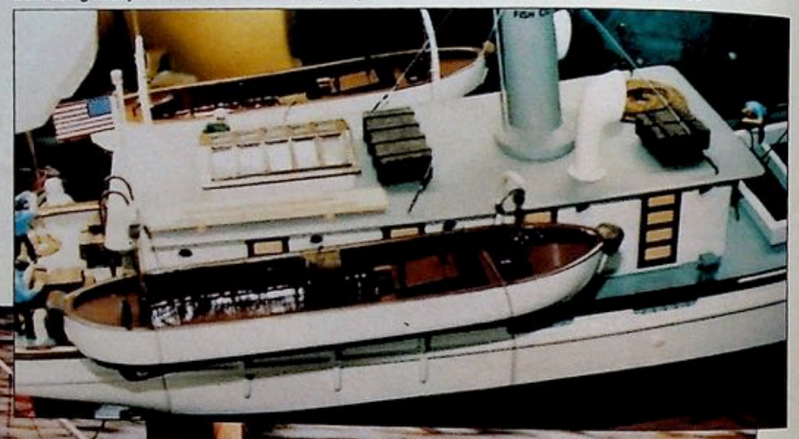
BY BILL NORTHROP

We're glad to hear from more and more model boat clubs around the country that are joining the Scale Ship Modeler's Association (SSMA). If this continues to build up, we'll soon have enough strength behind a single US ship model association to give us the clout we need for the US to have membership in NAVIGA, the world organization of scale model boating, and for that matter, all other categories of boat modeling. Until the US becomes a member of NAVIGA, it is impossible for US modelers to compete in world class competition under NAVIGA rules, here or overseas.

Several issues ago, we were discussing this need for a national ship modeler's organization in the US, which surprisingly enough, did not exist. Noting that the SSMA in Indianapolis, Indiana, seemed to have a solid foundation, and its act pretty much together, we encouraged its officers to go national. We're not trying to claim any credit for this taking place, as the club was already making steps in that direction, however, we did go public in supporting their effort to broaden the scope of their membership. Now there's something we have to clear up in our discussion about NAVIGA.

Previously, we erroneously referred to NAVIGA as the overall world organization. This is only partially correct. The overall world boating organization is the Union of International Motorboating (U.I.M.), and

(Bottom) Tom Burton, Phoenix, Arizona, built this fine example of the Bunker Boat published in *USB&SM*. This is the 61-inch, 1/2-inch scale version built from the enlarged plans for the original 36-inch long model. He used the fiberglass hull and deck produced by Hartman Fiberglass R/C and built his own superstructure.
(Below) Close-up of Tom's Big Bunker Boat shows plenty of detail. Tom ran into a bit of a problem from using heavy materials above deck, requiring extra ballast to counteract the top-heaviness.



NAVIGA is its model boating sub-organization. This is paralleled in aviation by the FAI (Federation Aeronautique International), and its model airplane sub-organization, the CIAM. We're not sure of the spelling out of NAVIGA, but the CIAM is the Committee for International Aero Modeling. In order for the United States to enter world competition in aviation, models or full-size, it must have a national aero club and a modeling subdivision to represent the US. It does, in the form of the NAA (National Aeronautic Association), and its modeling subdivision, the AMA (Academy of Model Aeronautics).

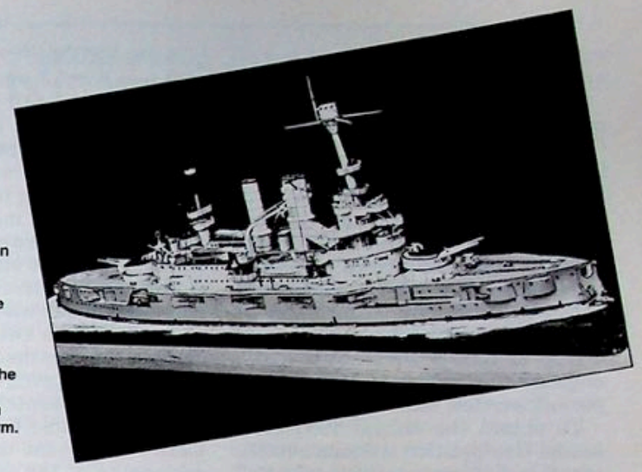
In the boating end of things, we do have an national organization that is a member of U.I.M., it's the APBA (American Power Boating Association). And the APBA now has as a subdivision, the APBA's R/C Model Racing Commission. However, as you can see by its title, the R/C Model Racing Commission is not really tuned to scale ship modeling, the nearest thing being the Scale Unlimited Racing category!

As to whether the SSMA can hook up directly with NAVIGA without going through an overall national US boating organization is up for question. Obviously, APBA does not appear to be the avenue to take, if it is necessary. Does anyone have some comments on this matter? In the meantime, we strongly urge local boat and ship model clubs to join up with SSMA. There's more to offer than just the possibility of world competition eligibility. There is a quarterly newsletter which contains a Calender of Events, a club flyer mailing service to help build up local competition activity, uniformity of rules based on a set of judging guidelines available to member clubs, regional events, wholesale buying of certain manufacturer's products, and most important of all, a club insurance program. For further details, write to the SSMA,, attention Dave Hampton, Director, 5218 Laurel Hall Dr., Indianapolis, IN 46226. Ann Hampton is the National Secretary. The phone number is (317) 545-1509.

SPEAKING OF REGIONALS

The Empire State Model Mariners will host the SSMA Mid-Atlantic regionals on June 10, 1990 in Flushing, Queens, New York. For more information, contact the ESMM at 4400 Beach 44ht St., Brooklyn, NY 11224, phone (718) 449-4481, Nelson E. Cruz, Commodore, and Regional Director District 2, SSMA.

PRECISION STEERING



We came across this photo of a military vessel left over from an ad placed by Paper Models International, 9910 S.W. Bonnie Brae Drive, Beaverton, OR 97005. Not being into military vessels of the era, we can't identify the ship, but it does show what can be done with printed paper in kit form.

The second Annual Precision Steering contest of the Maryland Attack Group will be held at Burba Lake, Ft. Meade, Maryland, on the 9th of June (rain date of June 16). Each entry will attempt to steer by R/C through an obstacle course comprised of miniature lighthouses, lightships, buoys, docks, etc. Starting with a score of 1000 points, deductions will be made for every error along the way. Entry fee of $5.00 for first entry and $2.00 for each additional entry. Trophies for first three places in three categories: Scale ships (electric or steam, no gas power allowed), Scale Sailboats, and Best of Scale. Obviously, surface frequency radios only. Contact Martin Hayes (301) 757-5593 or John French (301) 266-6757, for additional information.

MARINERS' MUSEUM

A new awards structure and new special awards have been added to the 1991 Mariners' Museum Ship Model Competition announced previously. First of all, a single award for the "Best of Show" will be presented. This is of course, for an overall winner regardless of category. Within each category, entries will compete against common high standards of quality rather than directly against each other. This is similar to racing, where the boats compete against the clock instead of head-to-head. The single entry with the best score above 90 will receive the gold medal. All others above 90 will earn silver medals. At the second level, all entries scoring between 80 and 89 points will receive bronze metals. There will also be a single Novice Award (well, the person can be married, we assume) for the best model that is either the first or second ship model by the entrant. This is intended to encourage beginners, regardless of age, replacing the previous junior division, but its entries

This minesweeper is a warship that is still in operation with the Mexican Navy. Built from scratch by Roberto Cardenas Abuin, from Mexico.

are also eligible for awards in the appropriate category.

Three special awards will also be presented. One is to be the Howard I. Chapelle Memorial Award, sponsored by the NRG. Another is to be the Newport News Shipbuilding Award, in the amount of $500., for the best model of a vessel built by Newport News Shipbuilding since its founding in 1886. The third special award is by the Steamship Historical Society of America, for the best model of a ship or boat powered by a steam engine, regardless of nationality, period, service, size, or kind of fuel.

To obtain the official 1991 Ship Model Competition Announcement, which includes competition rules and entry form, write to Ship Model Competition, The Mariners' Museum, 100 Museum Dr., Newport News, VA 23606-3798.

NEWSLETTER TRADE

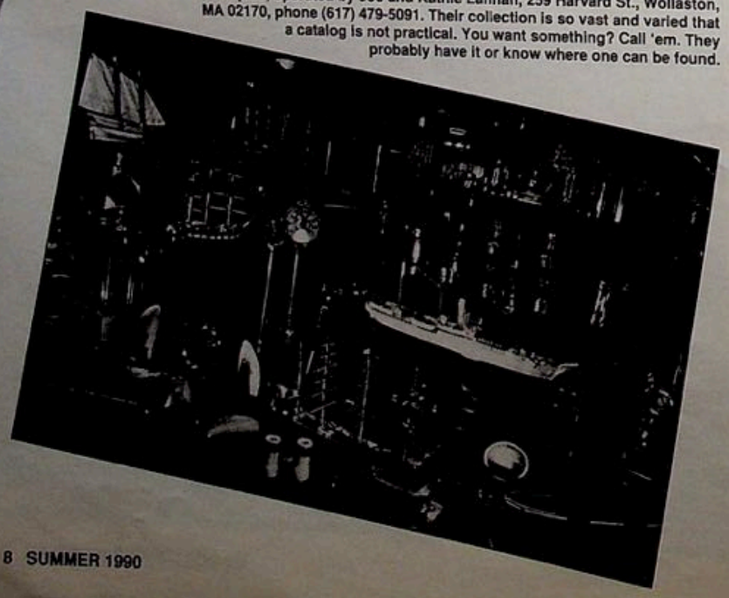
William Whitten, editor of the "The Port Tacker," newsletter for the Oxford (Alabama) Port Tackers M.Y.C., 1227 Littlebrook Lane, Birmingham, AL 35235, is looking for additional clubs with which he can trade newsletters. He already trades with about a half a dozen other clubs, and would like to add to the trading list. If you're interested, contact him at the above address. Incidentally, you might just include this magazine in your mailing, and if you're also interested in trading with other clubs, let us know, and we'll publish your request in this column. After all, that's part of what we're here for.

By the way, be sure to read Bill's article in this issue about taking pictures FROM your model boat. He sent us a copy of some video footage taken from his 10 Rater, and it's really wild! When the boat's on a broad reach and heeled about 20 to 30 degrees, the camera goes with it rather than trying to correct for the horizon, as you might do unconsciously if you were on the boat yourself and trying to shoot some video. And coming about on a tack or jibe at a marker is even wilder. The scenery and other boats swing by real fast! The final touch is the occasional sound of the water lapping at the bow when the boat encounters some larger ripples. Of course, the first thing Rod Carr would want to do is aim the camera up at the sails, so he could see what they're doing and how to improve their set!

TOP HEAVY!

Pictures of the first Big Bunker Boat that we have seen built from our plans and using Dwight Hartman's fiberglass hull, came by way of Dwight from Tom Burton, of Phoenix, Arizona. Take a lesson from Tom and be careful about the material you use for the superstructure. Tom went a little overboard on material size and weight, and discovered that it came out a bit top-heavy. By the time he corrected this by adding weight inside along the keel, he found that his new waterline was above the original, somewhat reducing the freeboard, but not enough to really be concerned. Tom has promised to send us more photos and additional information about his detailing. It sure looks good from the photos he sent along! •

Is this a nautical scene, or what? Actually, it's the office of Lannan Nautiques, operated by Joe and Kathie Lannan, 259 Harvard St., Wollaston, MA 02170, phone (617) 479-5091. Their collection is so vast and varied that a catalog is not practical. You want something? Call 'em. They probably have it or know where one can be found.



NATIONAL MODEL BOATING ORGANIZATIONS

AMYA
American Model Yachting Association
1884 Campus Ct.
Rochester Hill, MN 48063
President: Edward Helmle Jr.
Contact: Patricia Hein
Membership Secretary
313-652-6688

APBA
American Power Boat Association
(R/C Model Racing Commission)
5001 Stormy Ct.
Bakersfield, CA 93309
Contact: Wally Stewart
Vice President
805-398-1266

IMPBA
International Model Power Boat Association
Rural Route 2, Box 100F
Fountaintown, IN 46130
President: Gene Taylor
Contact: Sue Bathauer
Executive Secretary
317-861-3701

NAMBA
North American Model Boat Association
1815 Halley St.
San Diego, CA 92154
President: Jim Henry
Contact: Cathie Galbraith
619-424-6380

SSMA
Scale Ship Modeller's Association
5218 Laurel Hall Dr.
Indianapolis, IN 46226
Director: Dave Hampton
Contact: Ann Hampton
National Secretary
317-545-1509

BOOK REVIEW

BY PETER SHREEVES

THE JUNKS AND SAMPANS OF THE YANGTZE

It's been said that the Chinese don't rewrite their history the way their Russian neighbors do. They save themselves the trouble by not writing it down in the first place! This is probably an unfair assessment based on the meager supply of literature making its way to the West from a self-proclaimed closed society. It may also be unfair as many aspects of all cultures are not recorded regardless of where they are.

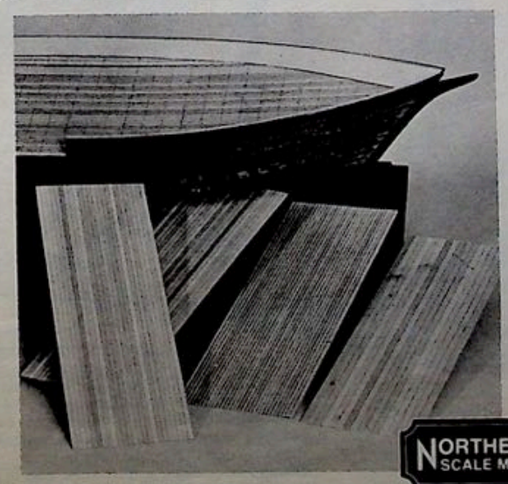
The most outstanding and memorable aspects of an era will usually be preserved somewhere, but it takes more in-depth research to put an era into context down to the most common, everyday feature. For instance, the New England seafaring community has long been viewed with fondness and romance by Americans. Yet, it is only through the efforts of a number of dedicated individuals that New England vessels and shipcrafting are preserved. Mystic Seaport was envisioned and created by a small group of individuals including the late historian Carl C. Cutler. Howard I. Chappell spent a great portion of his life documenting the characteristic craft of his native New England. What these authors did for one region David MacGregor did for his native England in his series on Merchant Sailing Ships. Creating a record of a region's common craft is a large undertaking and requires the skills and energies of a dedicated historian.

Imagine now, if you will, an author faced with documenting the common craft of a region as large as half of China. Not only must he deal with a subject that is only vaguely known to Westerners, but so is the culture and the region itself. Bad enough that there are few contemporary written sources to refer to, but the people, culture and language change from area to area! It is a tribute to the late G.R.G. Worcester that he took on the task at all, let alone that he provided a landmark work with his resulting volume *The Junks & Sampans of the Yangtze.*

Mr. Worcester worked as a River Inspector for the British government before the Second World War, which allowed him vast access to the river, its people and communities. He lived in the region for nearly thirty years during which he spent seven years preparing four books on the river and its craft. Those volumes were last published over forty years ago in Shanghai, but are now combined into a single volume from The Naval Institute Press. The current volume consists of over six hundred large format pages of text and illustrations making use of hundreds of maps, photographs, vessel drawings and diagrams. The combined volume is notable for its scholarship, beautiful execution, and considerable size.

The first book is an introduction to the Yangtze; its geography, craft, and people. The Yangtze is the world's second largest river and services an area measured in hundreds of thousands of square miles. The people who live or work on the river are as diverse as the river itself, from the busy ocean port of Shanghai to the white-water streams of the river's Tibetan tributaries two thousand miles away. A section is devoted to the history of junk design from the most ancient times, using the earliest Chinese sources and contemporary artwork from various dynasties. The author outlines the trade patterns that flow along the river and the many tasks that rivermen (junkmen) perform. He describes the general junk types that are encountered, and includes technical sections on subjects like sail design, hull construction, ropemaking, rigging, and use of specialized hand tools. Rounding out the book are discussions of the nature of Yangtze junkmen as people and their approach to work and life.

continued on page 38



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TEXT AND PHOTOS BY WALT MUSCIANO

"MARA" A Fine Ketch

One of modeling's best and most prolific designers presents a semi-scale R/C cruising ketch that can be returned to the dock if the wind dies, using its auxiliary electric motor.

(Top) The author checks controls before releasing "Mara" for an afternoon cruise. Being a true auxiliary, she can be returned to shore, even if the wind dies, by using the radio to switch on the auxiliary electric motor. (Above) "Mara" is a convenient size model; small enough to transport easily, large enough for realistic performance, and spacious enough for the radio control and auxiliary power equipment.

MARA is beautiful, stable, agreeable, swift, dependable and smooth. Truly, it is impossible not to fall in love with our Mara once you know her. Mara is a development of two previous double-ended ketch designs built by the author, and is the epitome of the scale model sailboat. The double-ended, two-masted ketch design features a wide beam, with lines that provide superb stability coupled with moderate speed; in many cases faster than powered scale models.

Mara is radio controlled, however, the craft can be made free sailing if desired. Our model can be operated on two or three channels; one for steering, the second to haul in or play out the sheet lines so as to arrange the sail angle to obtain the maximum results from the wind, and a third channel, as we used, to start an electric motor to bring the craft to shore in the event that the breeze stops and the model is becalmed in the middle of the pond.

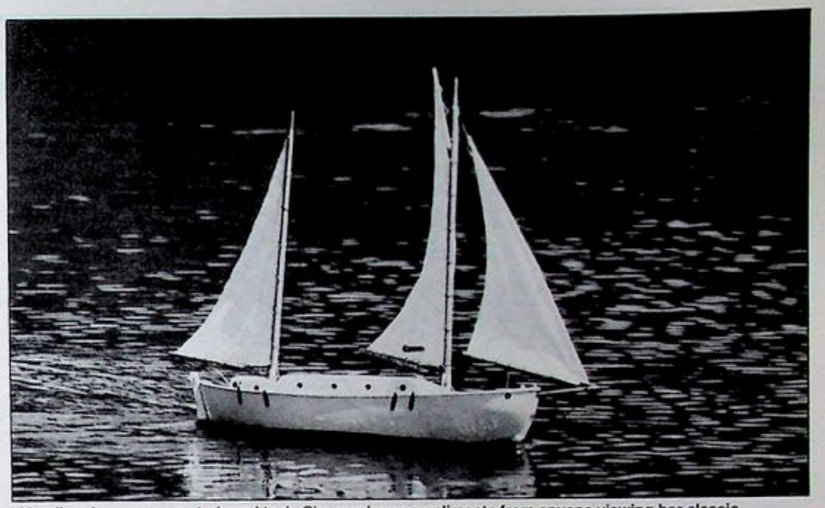
The sails can be lowered manually and the model operated on motor power alone when desired. Mara is a scale model patterned after the very popular wide-beam, double-ended ketch designs, many of which have sailed across oceans. *(Looks very similar to the well-known Tahiti Ketch. wcn)* Not only does the wide hull give Mara stable operation, but it also provides plenty of room in the interior for equipment. Although we installed the proportional Aristo-Craft Micro-Prop equipment and the Dumas/Probar sail control with success, any other dependable units can be used.

CONSTRUCTION

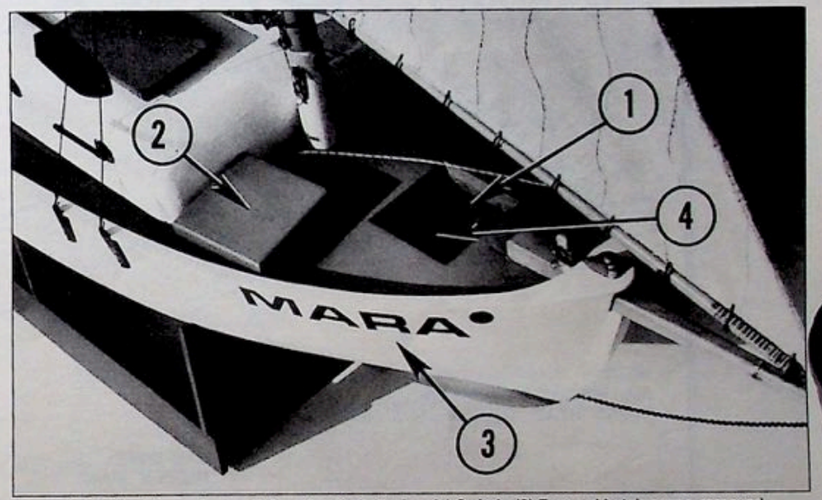
Keel pieces are traced and cut from 1/8 inch plywood and assembled along the spice lines, using plenty of cement. Two entire keels must be fabricated and then firmly cemented to each other. Before they are joined, a groove for the propeller shaft tubing must be cut into the inner surface of each keel half. Trial fit the brass tubing into the grooves by pressing the keel halves together around it. When the fit is good, roughen the outside of the brass tube with medium sandpaper and cement the tube in one groove, using plenty of the adhesive. Now, apply plenty of cement to the keel halves and clamp together. Let dry for several hours under weights. When dry, add cement to the ends of the tube installation. Be certain that the notches for the bulkheads are accurately cut after assembly.

Bulkheads, supports, and mounts are now traced and cut to shape from 1/8-inch plywood with a coping saw or jig saw. Cut the notches for the keel and chine accurately. The supports and mounts for batteries, masts, and electric motor should be inserted into the bulkhead slots, but not cemented, before the bulkheads are fitted to the keel. After the bulkheads have been cemented in place and are dry, the platforms can be moved into final position and cemented to the bulkheads. Using plenty of cement, fit the bulkheads into the keel notches, egg-crate fashion. Check the bulkhead alignment as the cement dries.

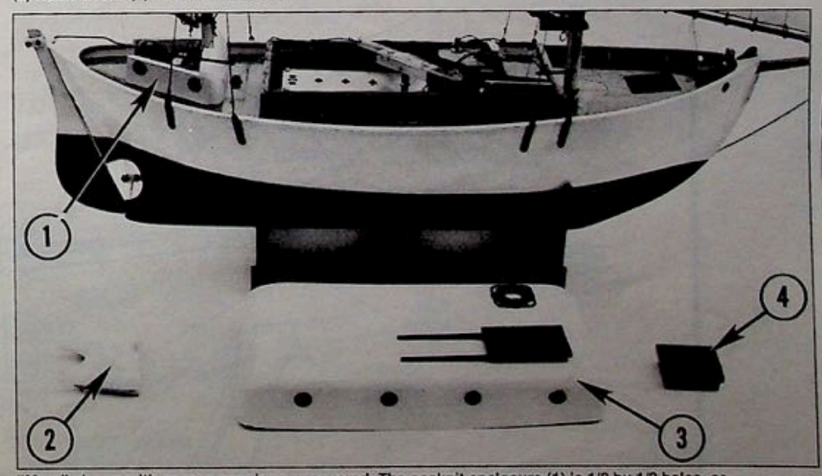
The deck is cut from 1/8-inch sheet balsa. The grain should run athwartships (from side-to-side instead of from bow to stern). Butt join the pieces together, using generous quantities of cement. Check the deck outline with the plans and be sure that



"Mara" under way, on a starboard tack. She receives compliments from anyone viewing her classic appearance and sailing ability.



Forward hatch holds receiver switch and radio batteries. (1) Switch. (2) Forward hatch cover, removed. (3) Name decal. (4) Receiver batteries.



"Mara" shown with access openings uncovered. The cockpit enclosure (1) is 1/8 by 1/2 balsa, cemented to deck and mizzen mast. Cockpit roof (2) is 1/2 inch balsa. Main Cabin (3) is 1/8 by 1/2 balsa. Forward hatch cover is 1/8 sheet balsa. Covers are fitted with plugs and main cabin fits over coaming, all to prevent water entry.

NOTE : ALL FITTING NUMBERS REFER TO THOSE MADE BY — A.J.FISHER , 1002 ETOWAH AVE. ROYAL OAK , MICHIGAN

SEW SAIL TO GAFF

5/16" BRASS BLOCK 105

SCREW & CEMENT

LINE D

BRASS TANGS 567

BED SHEET CLOTH SAILS

SAIL HOOP "B"

CUT EXTRA CLOTH ALL AROUND

LINE D

MIZZEN

SAIL AND RUDDER ANGLES

NOTE:
RUNNING RIGGING LINES A,B,C,D ARE 20 LB. TEST FABRIC FISH LINE - NOT MONOFILAMENT

NOTE:
ALL SCREWS ARE BRASS, ROUND HEAD, 1/16" DIA., 3/16" LONG

STITCH

SAIL

FOLD

FOLDING (HEM)

3/8" DOWEL MIZZEN MAST

1/4" DOWEL MIZZEN BOOM

DRILL 1/32"

SAIL HOOP "C"

LINE TO SERVO

BRASS TANG

CLEAT

0 1 2 3 4

SCALE — INCHES

1/16" BRASS WIRE GAFF HOOP

3/16" DOWEL GAFF

GAFF

PRESS PRONGS INTO GAFF

BRASS TANG 567

LINE B

5/16" BRASS BLOCKS 105

LINE C

LINE A

BIND WITH THREAD & CEMENT TO GAFF

GAFF HOOP

SAIL HOOP "A"

MAIN SAIL

HEAVY BLACK CARPET THREAD STAYS

1/2" DOWEL MAIN MAST

OPTIONAL BALSA RUNNING LIGHT

" DOWEL N BOOM

SAIL HOOP " B"

OOSENECK STYLE D-531

DRILL 1/32"

1/2" BRASS G

LINE TO SERVO

SHOWN PLUS 20" ON CLEATS

MAKE LINES LENGTH WRAP EXCESS LINE

SAIL HOOP "B"

.032" BRASS CLEAT

BEND

DRILL 1/16"

SAIL HOOP "A"

.046" BRASS WIRE

SAIL HOOP "C"

SMALL

.032" BRASS TANGS

DRILL 1/16"

LARGE

FITTINGS

ABOVE FITTINGS CAN BE MADE BY BUILDER IF DESIRED

SAIL AND RIGGING PLAN

SEW FOLDING (HEM)

FORESAIL

BRAILS (HEAVY SEWING MACHINE STITCHING)

LINE A

LINE C

3/8" BRASS GOOSENECK STYLE F - 530

LINE B

KNOT LINES B & C HERE

3/16" DOWEL FORESAIL BOOM

TO SERVO

DRILL 1/32"

SAIL HOOP "C"

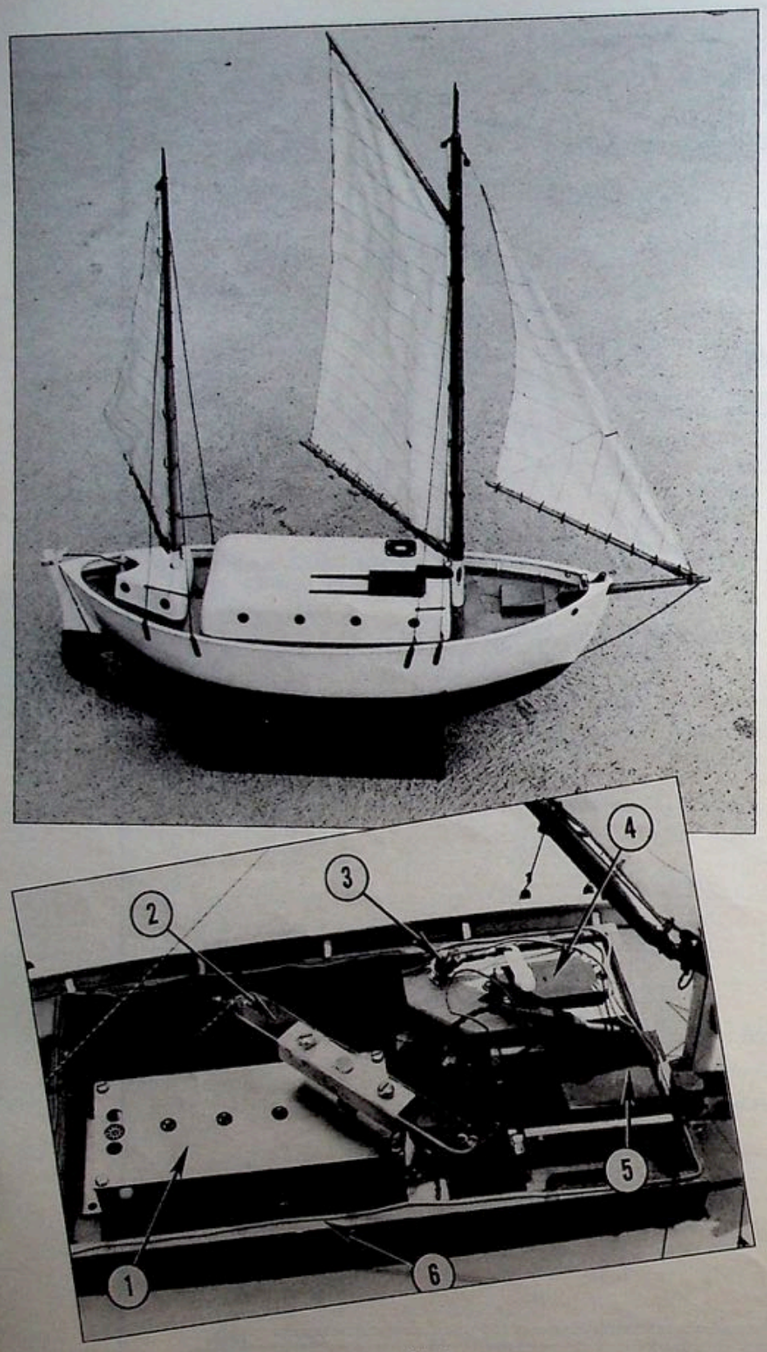
MARA

DECAL NAME

SCREWS

BRASS CLEAT 218 (BOTH SIDES OF MAST)

WAM



(Top) At rest on a stand made from 1/8 inch ply, "Mara" makes a fine decoration for coffee table, shelf, mantel, or desk, when not being sailed. Life ring and cabin hatch from 1/8 inch balsa. (Above) Dumas (Probar) sail control unit. (2) Dumas control arm cut to length. (3) Sail control switch mounted on ply base. (4) Sail control servo. (5) Receiver in 1/8 inch balsa box. (5) Antenna spot cemented around top of coaming.

the three openings in the deck are cut accurately. Also cut small holes for the masts in the deck. Slots must be cut along the deck edge for the bulkhead extensions that act as bulwark braces. Fit the completed deck atop the bulkheads and be certain the deck outline meets the edge of the bulkheads. When all fits well, cement the deck atop the bulkheads, using pins to hold it in place until the cement dries. Add more cement to the bulkhead/deck joints from the bottom.

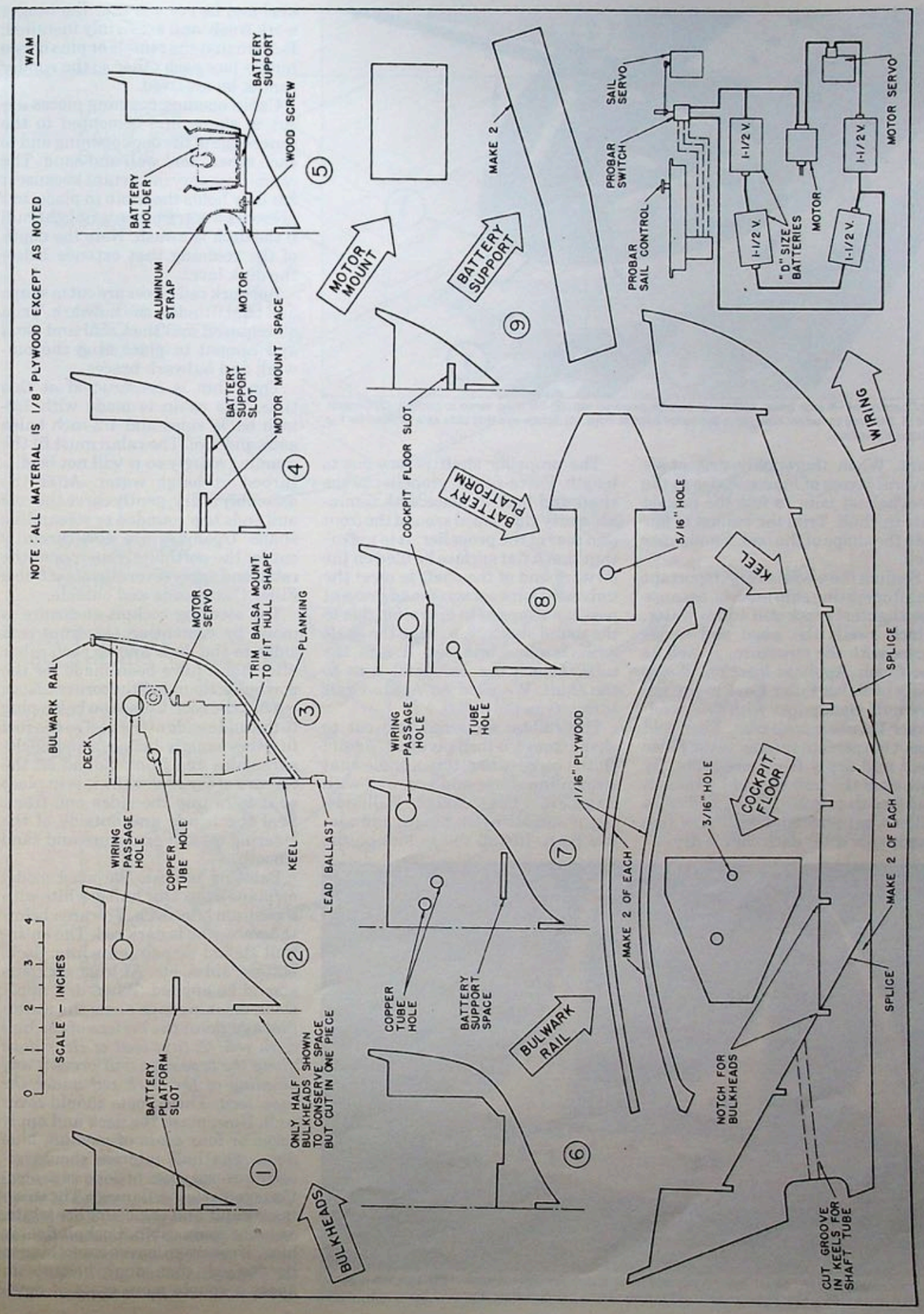
Planking strips are 1/8 x 1/4 medium balsa. All strips must be well cemented to the bulkheads and to the adjoining strips. The installation of the strips should alternate from one side of the hull to the other. Never add more than two planking strips to one side at a time without then applying two strips to the other side. Planking begins midway between the deck and keel. Use plenty of cement and hold in place with pins until cement is dry. When one strip is in place on each side, a planking strip is cemented to each side of the original strip on each side of the hull. Continue in this manner until the hull is complete. As planking progresses, it will be necessary to bevel the sides and taper the ends of each strip in order to insure a good fit. As the strips approach the deck, they should be continued above the deck until the proper height is attained. Those strips that are above the deck must extend from keel-to-keel, fore-and-aft, to form a bulwark. After the cement is thoroughly dry, the planking seams and planking joints with the bulkheads should be reinforced with additional applications of cement, using a long strip of scrap balsa to reach the inside of the hull. Trim the bulwark to the proper height.

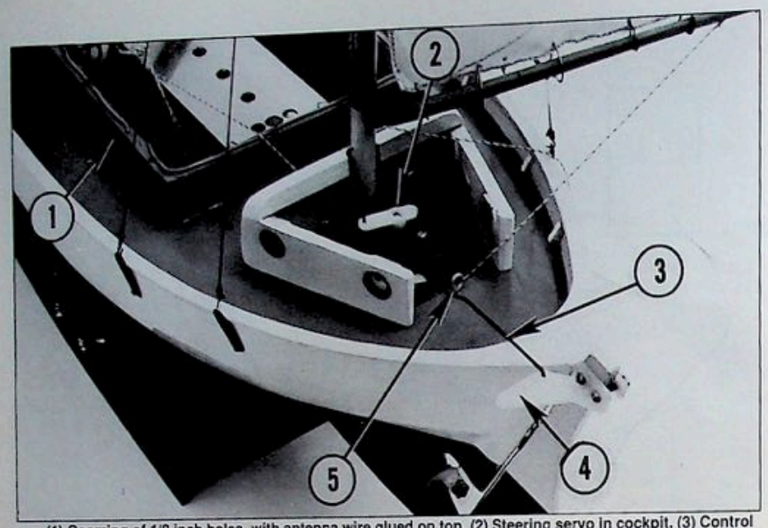
Hull end blocks are laminated from one-inch balsa, then roughly cut to shape, slightly oversized, and cemented to each side of the keel, the deck, bulwark, and fore-and-aft end bulkheads. Let dry overnight. Gently carve the blocks to shape, using the bulwark, planking on bulkheads and keel, as the guide.

Sandpaper hull thoroughly with fine and extra-fine sandpaper until smooth. Wipe cement into any cracks between planking strips, and sand again. All remaining cracks are filled with Plastic Balsa, pressed into place with a finger in a wiping motion. Sandpaper when dry and repeat again as necessary.

Steering cockpit is made by cutting sheet balsa pieces to form the sides and cementing them to the edge of the deck opening and the cockpit floor or platform, as well as to each other. Sand the edges flush with the deck when cement is dry.

Keel ballast is a bar of plumber's solder that is available at most good hardware stores. Drill holes and countersink for the wood screws. Mark the location of the holes on the keel and drill pilot holes in the keel. Apply cement to the keel and screw the ballast in place. Add a bead of cement all around the keel/ballast





(1) Coaming of 1/8 inch balsa, with antenna wire glued on top. (2) Steering servo in cockpit. (3) Control rod of .045 wire to rudder tiller (4), a Sig nylon control horn. (5) Screw-eye that acts as a fairlead for the mizzen sheet line.

joint. When thoroughly dry, apply several layers of Plastic Balsa to the keel/ballast joint to fair the ballast into the hull. Trim the ballast to fair into the shape of the bow. Sandpaper well.

Sealing the wood is very important on all operating ship models, because the slightest crack will admit water, which swells the wood and raises havoc with the structure, as well as the finish. Apply at least one dozen coats of Balsa Filler Coat to the entire hull. Sandpaper with fine sandpaper between each coat. Then add about ten percent thinner to the Filler Coat and apply five more coats. By this time the hull should be smooth and free from grain. If not, add more Filler Coat and sand with very fine sandpaper after each coat is dry.

The propeller shaft is now cut to length. Force-fit the propeller to the shaft and hold in place with 5-minute epoxy glue wiped around the front and rear of the propeller. It is important that a flat surface be filed on the forward end of the shaft to meet the universal joint set screw and prevent possible slippage in operation due to the round shaft. Now, wipe the shaft with vaseline and slip it into the tube. Attach the universal joint to the shaft. We used an Aristo-Craft spring type universal.

The rudder is traced and cut to shape from 1/8-inch plywood. Round off the corners to attain a somewhat streamline shape and seal well with Balsa Filler Coat. Add the Williams, Sig or similar nylon hinges and control horn. Install the rudder on the keel and be certain that the hinges work freely and are firmly installed. Be sure that the pintels or pins of two hinges face each other so the rudder cannot be removed.

In a fairly strong breeze, "Mara" heels gently and really knifes through the water. Note bow wave, plus good hull wave form which keeps rudder well submerged for positive steering.

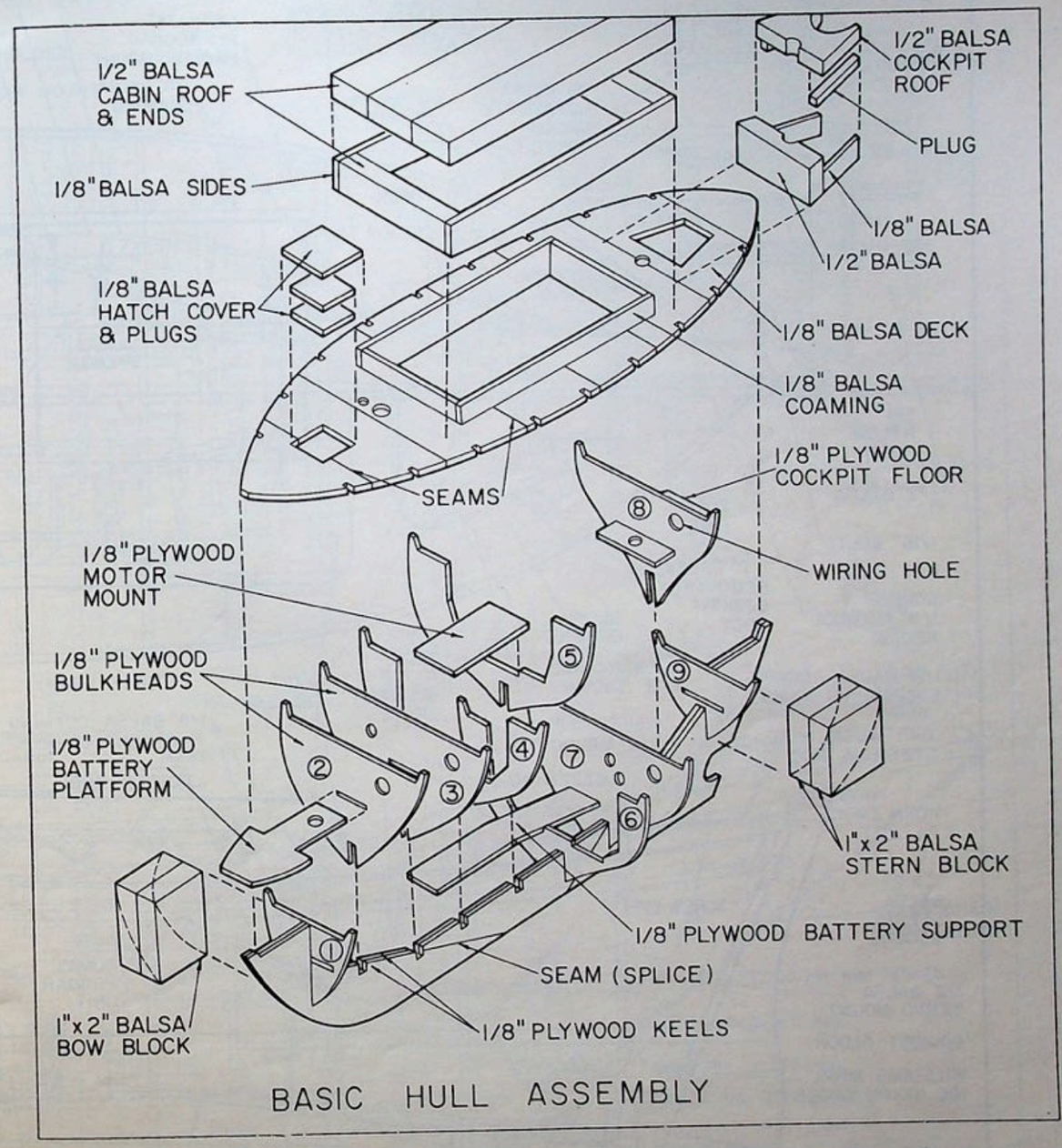
Cabin opening coaming pieces are cut to shape and cemented to the inner edge of the deck opening and to each other. Seal well and sand. The coaming is very important because it not only holds the cabin in place, but prevents water from entering the hull if the deck is awash. Note the depth of the coaming that extends below the deck level.

Bulwark rail pieces are cut to shape and trial fitted on the bulwark. Trim as required and then seal and sand and cement in place atop the bulwark and bulwark braces.

The cabin is constructed at this time. The cabin is made with 1/8-inch balsa sides and 1/2-inch balsa ends and roof. The cabin must fit the coaming snugly so it will not be disturbed in rough water. After the assembly is dry, gently carve the roof and ends to a rounded or streamline shape. Openings are now carefully cut for the portholes. Sandpaper the cabin and apply several coats of Balsa Filler Coat inside and outside.

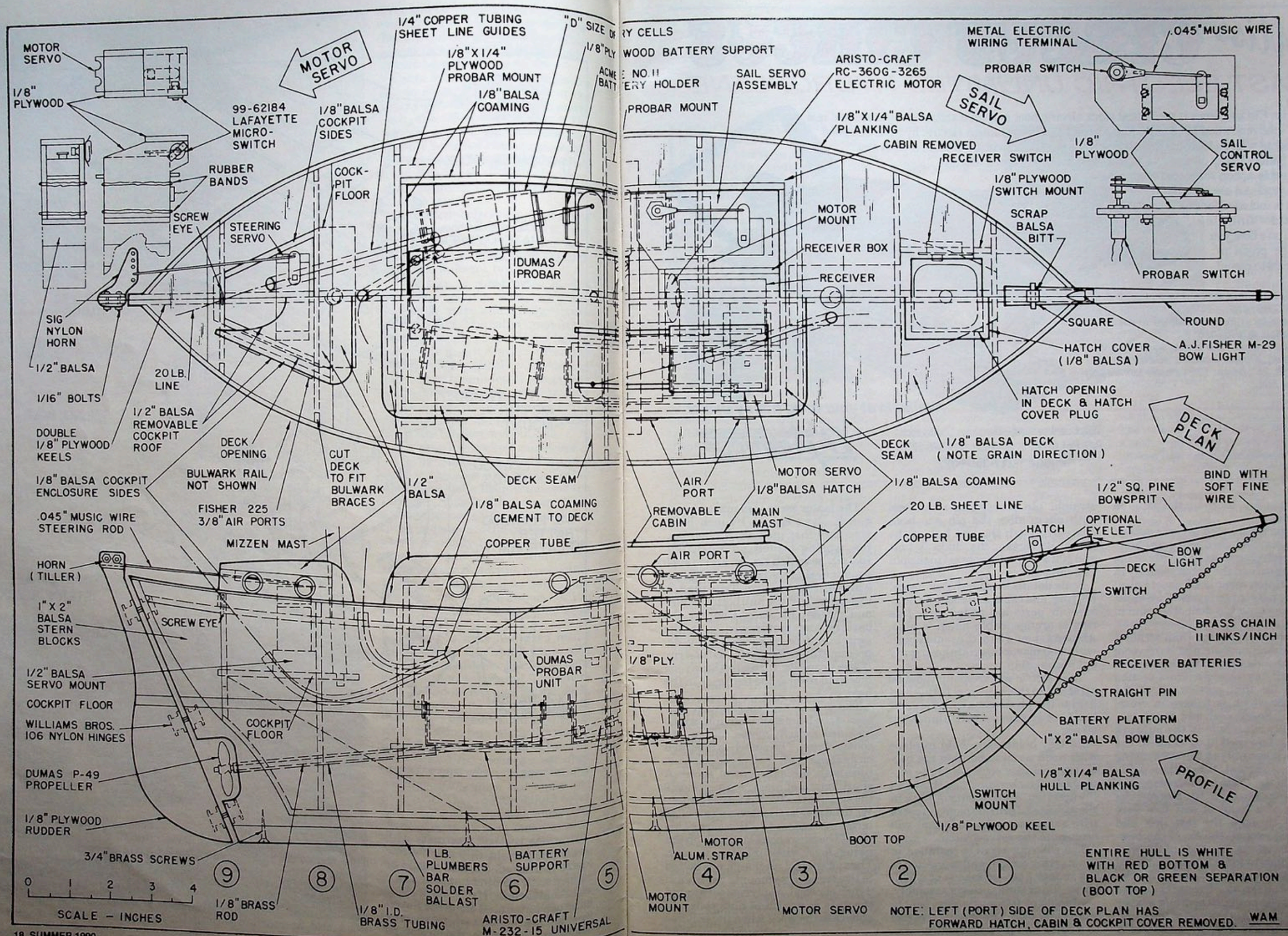
The steering cockpit enclosure is made by cementing the front and sides to the deck and to each other after holes have been made for the portholes. Round off the corners. Now, cut out the roof. Cement a balsa plug to the underside of the roof so the roof fits very snugly between the enclosure sides and front. Round off the corners of the roof while it is in place so it fairs into the sides and front. Seal the inside and outside of the steering cockpit enclosure and sand smooth.

Painting is next. We used model airplane dope. Our hull is white with a medium blue deck. The area below the waterline is dark red. The entire hull should be painted white: deck, bottom, sides, etc. At least six coats should be applied. When dry, apply clean masking tape along the waterline and paint the bottom of the hull dark red. *(A first coat of clear dope along the tape edge will prevent any bleeding of the dark red under the tape. wcn)* Three coats should cover well. Now, mask the deck and apply three or four coats of medium blue dope. The hull interior should receive several coats of dope as protection against water damage. The steering cockpit and enclosure are white, as is the main cabin. Cockpit floor is blue. If coverage leaves something to be desired, then don't hesitate to apply a couple more coats of dope.



Thin out the last few coats with about ten percent thinner. If a fine lustre is desired, the hull should be rubbed with rubbing compound on a soft flannel cloth. If desired, a black band can be painted along the waterline, separating the white and red colors as appear on the prototype model.

Rigging line tubing is installed now. This should be heavy-wall copper tubing so it doesn't kink when it is bent into small radius curves. Tubing is the best way to guide the sheet lines from inside the hull to the booms. Bend and fit constantly until the necessary curve is achieved. Be certain that the inner edges of the tubing are smooth in order not to injure the rigging line; in fact, a slight flare at the tubing openings is good to have. Install carefully, using plenty of cement in the hull interior and brace with balsa as required. When


MOTOR SERVO
1/8" PLYWOOD
99-62184 LAFAYETTE MICRO-SWITCH
RUBBER BANDS
SCREW EYE
SIG NYLON HORN
1/2" BALSA
1/16" BOLTS
20 LB. LINE
DOUBLE 1/8" PLYWOOD KEELS
1/2" BALSA REMOVABLE COCKPIT ROOF
1/8" BALSA COCKPIT ENCLOSURE SIDES
BULWARK RAIL NOT SHOWN
DECK OPENING
FISHER 225 3/8" AIR PORTS
.045" MUSIC WIRE STEERING ROD
HORN (TILLER)
1" X 2" BALSA STERN BLOCKS
SCREW EYE
1/2" BALSA SERVO MOUNT
COCKPIT FLOOR
WILLIAMS BROS. 106 NYLON HINGES
DUMAS P-49 PROPELLER
1/8" PLYWOOD RUDDER
3/4" BRASS SCREWS
0 1 2 3 4
SCALE - INCHES
9
1/8" BRASS ROD
8
1/8" I.D. BRASS TUBING
7
1 LB. PLUMBERS BAR SOLDER BALLAST
6
BATTERY SUPPORT
5
ARISTO-CRAFT M-232-15 UNIVERSAL
MOTOR SERVO
1/4" COPPER TUBING SHEET LINE GUIDES
1/8" X 1/4" PLYWOOD PROBAR MOUNT
1/8" BALSA COAMING
1/8" BALSA COCKPIT SIDES
COCK-PIT FLOOR
STEERING SERVO
DUMAS PROBAR
CUT DECK TO FIT BULWARK BRACES
1/2" BALSA
DECK SEAM
1/8" BALSA COAMING CEMENT TO DECK
MIZZEN MAST
COPPER TUBE
COCKPIT FLOOR
DUMAS PROBAR UNIT
1/8" PLY.
BOOT TOP
MOTOR ALUM. STRAP
MOTOR MOUNT
4
3
2
1
MOTOR SERVO
NOTE: LEFT (PORT) SIDE OF DECK PLAN HAS FORWARD HATCH, CABIN & COCKPIT COVER REMOVED.
WAM
ENTIRE HULL IS WHITE WITH RED BOTTOM & BLACK OR GREEN SEPARATION (BOOT TOP)
PROFILE
SWITCH MOUNT
1/8" X 1/4" BALSA HULL PLANKING
1/8" PLYWOOD KEEL
1" X 2" BALSA BOW BLOCKS
BATTERY PLATFORM
STRAIGHT PIN
RECEIVER BATTERIES
BRASS CHAIN 11 LINKS/INCH
SWITCH
DECK
BOW LIGHT
OPTIONAL EYELET
HATCH
COPPER TUBE
1/2" SQ. PINE BOWSPRIT
BIND WITH SOFT FINE WIRE
20 LB. SHEET LINE
1/8" BALSA COAMING
1/8" BALSA HATCH
MAIN MAST
REMOVABLE CABIN
AIR PORT
AIR PORT
PROBAR MOUNT
SAIL SERVO ASSEMBLY
ARISTO-CRAFT RC-360G-3265 ELECTRIC MOTOR
1/8" X 1/4" BALSA PLANKING
CABIN REMOVED
RECEIVER SWITCH
1/8" PLYWOOD SWITCH MOUNT
SCRAP BALSA BITT
MOTOR MOUNT
RECEIVER BOX
RECEIVER
SQUARE
ROUND
HATCH COVER (1/8" BALSA)
A.J. FISHER M-29 BOW LIGHT
HATCH OPENING IN DECK & HATCH COVER PLUG
DECK SEAM
1/8" BALSA DECK (NOTE GRAIN DIRECTION)
DECK PLAN
METAL ELECTRIC WIRING TERMINAL
.045" MUSIC WIRE
PROBAR SWITCH
1/8" PLYWOOD
SAIL CONTROL SERVO
PROBAR SWITCH
SAIL SERVO
WOOD BATTERY SUPPORT
NO. II
ERY HOLDER
RY CELLS

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- *Deluxe Kit – Factory built up to radio installation. #CIRB1020*
- *Ready-To-Run – the fastest way to get on the water! JR radio included. #CIRB10***
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hobby Dynamics™

cement is dry, touch up the paint on the deck.

The forward hatch cover is cut out and assembled. Seal and paint blue. The hatch plug must fit tightly in the opening to hold the hatch securely in place. Hatch cover is 1/8 sheet balsa, and the plug is two layers of 1/8 sheet balsa cemented to each other and to the cover.

The bowsprit is cut from straight grain dowel or a strip of hardwood, such as pine. Taper as shown. The bowsprit has a circular cross-section except for that portion aft of the bulwark which is square in cross-section. Sand, seal and paint tan. Carefully cut a hole in the bulwark for the bowsprit and cement the bowsprit securely to the deck, using plenty of cement. When thoroughly dry, add the chain to the bowsprit by fastening one end to the bowsprit by means of a band of soft fine wire passed through the last link and wrapped around the tip of the bowsprit. Twist the two ends of the wire with pliers to form a tight band and snip off all but about 1/8 inch of the twisted portion. Press the wire against the bowsprit and add a layer of cement. The other end of the chain is held to the keel by means of a straight pin pressed into the keel with pliers after the pin has been passed through the end link of the chain. Be certain the chain is taut and add a droplet of cement to the pin attachment.

Scale details, such as cabin hatch, life ring, and cabin and cockpit enclosure air ports are added now. Life ring is orange, cabin hatch is blue. Air ports should be of the sealed type, with clear plastic inserts to keep spray out of the cabin.

The electric motor should now be attached to the universal fitting and held to the plywood base with round head wood screws and aluminum straps.

Battery holders are held in place with wood screws and then the necessary wiring is soldered to the motor and holder terminals as shown on the diagram. Allow plenty of slack in the wiring and provide plenty of extra wire at the two open ends that will connect to the servo switch.

The steering servo is installed in the steering cockpit and connected to the rudder horn by means of a Williams, Sig or similar clevis assembly, or a length of .045 music wire, bent to shape as shown. The servo is screwed to a balsa and plywood mount.

The motor servo is mounted in a 1/8-inch plywood and 1/2-inch balsa structure that includes a push-button, spring-loaded micro-switch. Install the switch firmly, and in such a manner that the button is within 1/8 inch of the servo arm. Trim the 1/2-inch balsa to fit the hull bottom shape and cement in place. Connect the battery and motor wiring to the switch and test the circuit by depressing the switch with a balsa strip. If the propeller turns in the wrong direction reverse the batteries in the holders.

The sail control mechanism consists of the Dumas/Probar unit, which includes switch, motor, gears and control arms. The switch is mounted on a common 1/8-inch plywood structure with the sail control servo. A short length of music wire connects the servo to the Probar toggle switch. We used an electrical wiring circular terminal soldered to the wire. This should be the correct size to fit on the switch lever without excessive play. The sail control mechanism is bolted to two transverse mounts cut from 1/8-inch plywood. Apply cement around the nuts or use blind nuts that will adhere to the wood when the bolt has

continued on page 38

RADIO WAVES

BY ELOY MAREZ

If this is your first visit with me here in "Radio Waves," you're going to feel like you've walked into the theater in the middle of the film. You will begin to understand what is going on after a while, but to get the whole story, you'll have to go back to the beginning. The beginning in this case was in the last issue of *USB&SM*, in which we discussed the basic physical laws and terminology under which the power system in an electric powered boat is operating. We recommend that you borrow, or horrors, purchase, a copy of the Spring '90 *USB&SM* so you will have a good idea "watts" going on.

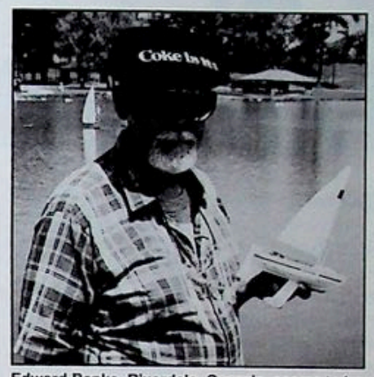
As we detailed then, the unit by which we measure electrical energy is the watt, being the product of the applied voltage times the current consumption in amperes. Watts being somewhat elusive creatures, in that we can't see them, I will tell you that it takes 746 of them to convert into one horsepower. Now horsepower is something of which we all have a better mental picture, from our experience with auto or other gasoline engines. We also know what the one horsepower 100VAC electric motor looks like... which makes one wonder about the power claims we read about from the many model electric motor makers trying to convince you that theirs is the motor you should buy.

In that respect, another thing that I find less than completely honest is that such motor claims often also make something of a point of the low weight of the motor, yet never seem to mention the weight of the batteries required. In any energy conversion system, such as in this case, the conversion of electrical to mechanical energy, one must include the total package... the total package in this case being the motor *and* the battery.

A close relative of the watt is the watt-hour, which is merely the base unit versus time. Ten watt-hours, for example, signify the consumption of ten watts for a period of one hour.

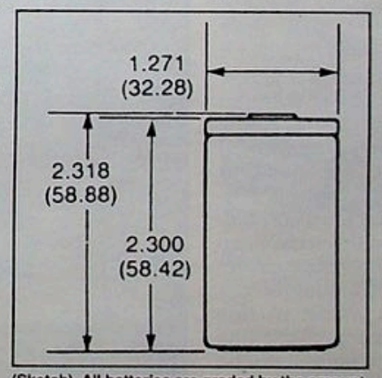
Anyway, we established the ground rules, now let's talk a bit about the primary source of our energy, the battery. I do want to repeat that none of this is aimed directly at helping you go faster, but at helping you to understand more about what is going on when you throw the switch. Forearmed with that knowledge, you will in time be able to help yourself go faster.

Most discussions about batteries for electric powered boats center on what too many are erroneously calling a "nicad," because too often you see it written in that manner. In actuality, the term is correct only when one refers to batteries of that type as manufactured by Saft America Inc., whose parent company I believe is French, and who holds the copyright on the term, having acquired it from Gould Inc. Referring to all nickel cadmium batteries as nicads is like calling all refrigerators "Frigidaires," or all vacuum cleaners "Hoovers." If you are nitpicky like me, the only correct nomenclature is the chemical designation "NiCd," which of course pronounces almost the same.



Edward Banke, Riverdale, Georgia, seems to be saying, "Wanna bet it won't?" His Robbe "Cosar" sailboat is not supposed to be for R/C, but it is. It was given to Ed as a joke by his friends, but the joke backfired, as he installed two-channel radio, for rudder and sail control! Ready for a new class, AMYA?

So much for the part about perfection. Now as we all know, there are many kinds of batteries to be found, some rechargeable and others not. The fact that NiCds are rechargeable is one of the main factors of their popularity in the R/C hobby. Before the advent of electric power for models, when we used NiCds only in the R/C equipment, we could also state that in the long run, NiCd power was cheap. That is no longer true, as the abuse to which these cells are subjected when used as the motive power source seriously reduces their life span... and increases their cost per run. But that is the price one has to pay for high performance, which is another of their redeeming features, their ability to produce extremely high amounts of current.



(Sketch) All batteries are graded by the amount of energy they can produce in relation to their size and weight. See text for explanation and comparative figures for "D"-size cells of three different chemistries.

There are more parameters than the ability to accept recharging, the cost, and their current-producing capacity that must be considered in the selection of a battery. They... all batteries, are primarily judged in another manner, what is called their "energy density." The measure of a cell, and ultimately a battery's energy density, is further broken down into two categories; its "gravimetric energy density" and its "volumetric energy density."

The gravimetric energy density of a cell is a measure of its available electrical energy in relation to its weight. It is stated in watt-hours per pound... or per kilogram, if you have finally admitted that the metric system makes more sense and have learned to use it.

The volumetric energy density of a cell, as you might expect, is the measure of its electrical energy in relation to its size. It is stated in watt-hours per cubic inch. Or liter.

For those of you who like to do your own calculations, the actual formulas are:

Gravimetric: Drain in Amperes x Service Hours x Average Voltage divided by the Weight in Pounds or Kilograms.

Volumetric: Drain in Amperes x Service Hours x Average Voltage divided by the Volume in Cubic Inches

continued on page 56

PRODUCT SURVEY

BY STU RICHMOND

The ACE "NAUTICAL COMMANDER" Radio

It looks like Ace R/C chose an international panel of active boaters, had them decide what they'd want in a custom-designed R/C system, and then actually built that dream system in three different versions to fit everybody's pocketbook. Smaller businesses succeed outside the shadow of giant competitors by doing what their competitors either can't or *won't* do. Other R/C system manufacturers have adapted their transmitters (and software modules) to marine suitability. But Ace has made a fresh conceptual start with a vinyl-clad metal case and done what the giant overseas manufacturers haven't—they've built an all-nautical radio that is sure to be sold around the world!

This review radio has been studied by the Central Florida R/C Think Tank's five members... it's been in the hands of modelers from Czechoslovakia, Sweden, and Hungary... it's been handled by a power boater with a shelf full of IMPBA first place winnings... and one of our Think Tank members (Bob Benton) is an avid sailboat and electric power enthusiast. There has been only a single suggestion made for an additional feature—and the others all said that this additional feature wasn't practical and should *not* be incorporated. In short, none of us could envision an improvement in the conceptual design of the Nautical Commander.

The review radio shown in this photo series is the top-of-the-line "Deluxe Version" and comes with the seven-channel transmitter that has an extra (yes, another!) RF or radio frequency deck as well as upscale 800 mAH Sanyo SCR cells in a plug-in battery pack. One RF deck is up on the 75 MHz band for surface-only use. The other RF deck is also already installed inside the Tx case and is on the 27 MHz band. If you're not into competition, this dual board feature may not mean much to you, but all the big meets require pre-

(Above) The Ace R/C Nautical Commander boat radio system is specifically designed for the marine modeler. (Right) The transmitter is built into a vinyl-clad metal case . . . by American hand labor in a modern American factory. The rear cover easily removes for access to user-adjusted controls and features. Bottom/right is the encoder board with reversing switches. Two radio frequency (RF) decks are diagonally opposite.

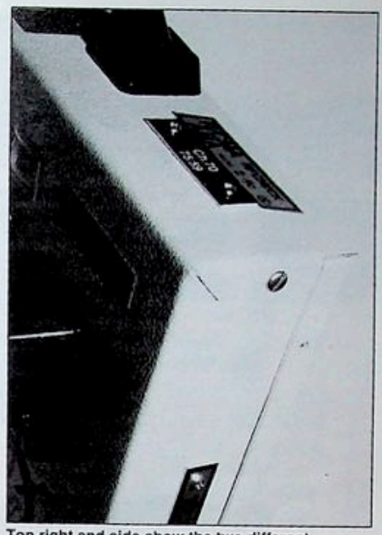
registration, which requires giving a first choice of frequency as well as an alternate choice. This dual RF deck system pretty well assures you of not being blocked out of competition because you weren't the early-bird with your pre-registration. Smart!

Our review system came with the Model 91 double deck design receiver, a seven-channel dual-conversion deluxe AM unit that was tuned to our 75 MHz Tx deck. To use the alternate 27 MHz Tx deck, requires buying another receiver for the matching 27 frequency. The single non-practical suggestion was to use a multi-pin switch on the transmitter to switch between the two frequency bands, but all the others said the presence of that single switch and the problems it could cause through accidental movement made the idea totally impractical.

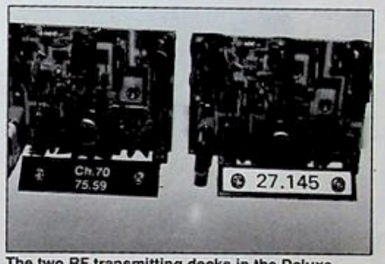
Ace R/C makes extensive use of Deans electrical connectors or plugs. To change RF decks in the transmitter the Tx case is flipped open and the two plugs are removed from one deck and simply plugged into the other deck. The transmitter has a number of internal features that are user-adjustable, so the rear cover of the vinyl clad case isn't closed with metal screws; it closes with four dimples that register with four small holes for easy opening/closing with a gentle squeeze. The Tx weighs one pound and fourteen ounces (about average) and the photo sequence around the transmitter's internals should let you study and then feel more comfortable as you open the case of your own Nautical Commander to make maximum use of its features.

Both RF decks are virtually identical (the circuit boards are), but the crystals and the number of turns on the tuning coils are varied to get the different RF bands. The output transistor is a Motorola 2N3724 with a black vaned heat sink around it. This unit gets hot, so be sure to allow cool-down time before handling. The Deans plugs are provided with side grooves; you simply match the grooves to maintain proper polarity on the red-black-white cable. The other cable comes from the base of the antenna and is a double brown twisted cable whose plug has no grooves, as polarity here does not matter. If your fingers are too big, there are two obvious screws (on the frequency plates) that loosen and the deck will slip right out for easy access to the Deans plugs... simple!

Another major advantage of the dual RF decks is that each has its

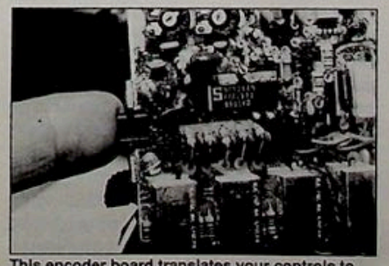


Top right and side show the two different frequencies on two different bands of the Deluxe Version: 75.59 mHz and 27.145 mHz. Transmitter comes with gold sticker in place, though not required for maritime use.



The two RF transmitting decks in the Deluxe Version. An ideal system for the serious model boater.

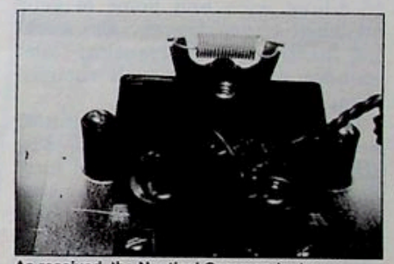
The two T-Bar handles are for individual sail or throttle control, rudder control stick is to the right. Toggle switches below T-Bars are two more controls, as are the two inclined slide switches on the side. Other slide switches are trim levers.



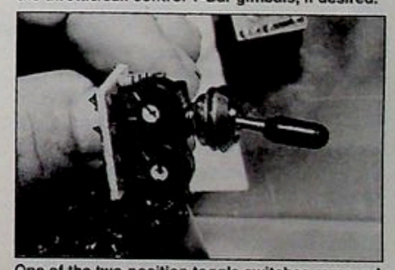
This encoder board translates your controls to data that the transmitter sends to its matched receiver. Four switches at the bottom are for servo reversing. Finger points to charging jack.

receiver tuned to it—you'll have a more glitch-resistent and stronger out-link performance between you and your boat than if you'd just swapped crystals on the 27 MHz band to an open/unused frequency. The avid competition boater can tell you about crystal swapping and adjacent channel problems during the heat of competition!

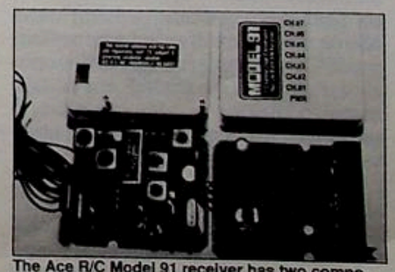
The use of 800 mAH Sanyo SCR cells in the Tx and Rx of the Deluxe Version may look at first like extravagant use of very expensive components (about $6 per cell!), but they'll give lots of reliable operation time. More importantly, the CFR/CTT feels that soon we'll be able to buy and use high rate 12-volt chargers that will hook to our car battery, and charge our R/C system's batteries in only fifteen minutes to about 90% of capacity! It's just a matter of time until charge 'n float in fifteen minutes is accepted... and the Sanyo



As received, the Nautical Commander has a centering spring installed only on the rudder control stick gimbal. Others may be installed on the throttle/sail control T-Bar gimbals, if desired.



One of the two-position toggle switches removed from the case. Each one controls a servo, and the two ends of the servo travel are set by the two small, round, black, adjustable potentiometers.



The Ace R/C Model 91 receiver has two component boards that fit together in a cube shape. Ace also has an economical kit for assembling your own receiver.

SCR cells are those the manufacturer says are adaptable to fast charging. These systems come with a transmitter, receiver, switch harness, receiver battery, 110-volt charger and other small accessories, but no servos. Due to the nature of maritime use, you select the appropriate servos and wire them into the Deans plugs that come with the system. The 110-volt charger requires 24 hours for the SCR cells.

Our Deluxe Version transmitter has twin vertical "T-Bar" sticks for independent control of sails or twin electric motors or twin internal combustion engines. Rudder control is from the right hand stick. The trims for the T-Bar sticks are above them; rudder trim is below the rudder stick. Below the T-Bar sticks are two on-off switches for two more control channels, such as running lights and music or other on-off functions. The manual even tells you how to adjust each end point of your switched servos' travel... the working functions of the Nautical Commander were really well thought through!

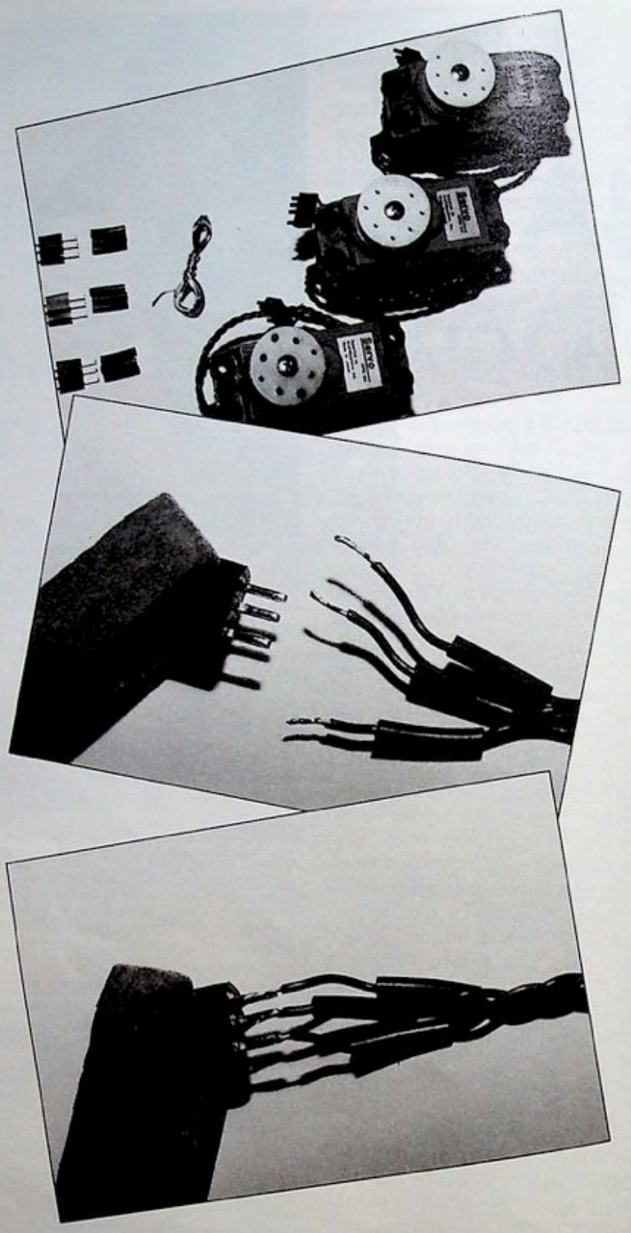
On the left side of the transmitter are two more channels controlled by slide levers that are inclined forty degrees from the vertical, so that your left index finger moves them in a bio-human natural direction of motion. Ace R/C has done something very clever electrically in the wiring of all five of the slider and trim levers. They have a series connection of a fixed resistor—a five K pot—and another fixed resistor. Your finger moves only the five K pot and the results are very accurate. It's sort of the reverse or opposite function of an expanded scale voltmeter's accuracy, as you electronics types will understand.

The gimbals or stick motion mechanisms for the three control sticks are identical. The rudder stick comes with a centering spring installed that gives "left" and "right" steering. Springs are supplied so that you can easily add them to the two T-Bar sticks too so that center would be "off" and above and below would become "forward" and "reverse" propulsion... clever, huh? The spring draws two metal centering blades together to mechanically draw the control stick to neutral as the blades close on a nylon centering post in the gimbal structure.

We were not totally satisfied with the preciseness of the gimbal's centering action. The Central Florida R/C Think Tank members are mainly model airplaners and much of our evaluation of radio systems depends on the quality and preciseness of servo centering and movement when a command is sent from the transmitter. We routinely expect at least fifty percent of the given commands to drive the servo to one-quarter of one degree (or less) of rotation variance. The best we could measure with our cycling plots on the Nautical Commander's rudder was nineteen percent return to one-quarter of a degree and twenty-eight percent return to one-half degree. This was deemed very acceptable for water speeds below fifty knots. The gimbal design also appears such that its preciseness will increase if there is any wear with usage. (Ace R/C produces an upscale system for airplane use that features metal gimbals that have an excellent reputation for performance.)

This Deluxe Version comes with the Model 91 dual conversion re-

continued on page 59



As explained in the text, you make your own choice of servos, and if they are already equipped with connectors, you may have to change them to match the receiver, as in this case, using the supplied Deans connectors. First you snip off the old connectors, strip back the insulation, pre-tin the wires and the connector contacts, slip on the insulation shrink-tubing, and then solder the wires to the contacts. Spring-type clothespin makes a handy holder while doing the job.

INNOVATIVE SAILBOAT DESIGN

BY FRANCIS REYNOLDS

In previous issues of this excellent magazine I have talked about an R/C model with a Wingsail and about Automatic Sail Trimming on R/C Racing Yachts. In this issue I would like to discuss some more, and different, ideas for the design of faster racing sailboats, some of them widely accepted, and others little known and/or controversial. I personally haven't been active in R/C yacht racing for 30 years, which means I am not familiar with the latest trends, classes and rules in the field. But, as you may have recognized in my two previous articles, "new" and useful technology is not restricted to things that have been discovered, invented, or developed in recent years. Let me throw some old "new" ideas your way.

I don't claim that these features would be legal in competition in all or any of your present classes. That will be *your* problem. We will look at ways to design and build potentially faster model sailboats. It is up to you model sailors, collectively, to decide whether you want to race faster boats by amending the rules, establish new classes for these improved boats, or ignore progress and continue to race conventional boats.

Another observation: the fastest possible model sailboat is not going to be a scale model of the fastest possible full-size manned sailboat. Why? Because the model will operate at a much lower Reynolds Number and its sail will be operating close to the water where the wind velocity is less, it's skipper is not on board, waves effect it differently, and other factors. When I was designing racing model sailboats I didn't *want* my innovative creations to be conventional looking. If they had come out looking like scale models it would have told me that I had done a poor job of engineering (naval-architecturing?), since the conditions and requirements between small size and full size are different.

Actually I should avoid using the word "sailboat" here, because we all know what "sailboats" look like and that is probably not what our innovative "thing" is going to look like. "Small-size unmanned wind-driven marine vehicle" would be a better description here, because it is less apt to restrict our creative thinking.

Beauty is another consideration. Sure I like my models to look good, at least to me; but since I'm not trying to scale down full-size boats, they don't need to look like conventional boats to look good. Beauty is in the eye of the beholder. If the beholder is an old time sailor, perhaps any deviation from traditional practice will destroy the beauty of the boat to his eye. Not to my eye. Progress is my major goal, so that which is technically better tends to be beautiful to me.

There is an oft-quoted saying in design circles: "If the design *looks* good it *is* good." In my experience the saying has some merit. Beauty is a very personal thing, and depends a lot on one's experience and interests. I find that my own designs tend to look better to me than other people's designs do (mine may look awful to them), and the beauty of a configuration will seem to wax and wane with my ongoing evaluation of the technical merits of the design.

I disagree with the assumption that the object of all model builders is to copy full-scale boats, planes, or whatever. Scale modeling has its place, but it has seldom been my own hobby. Of much more interest to me is the development of "models" that are *better* than small-scale replicas of full-size machines would be. It is more rewarding to be an innovator than a copier. Let's let the full-scale designers follow us "modelers" once in a while. We are as smart as they are. I've done my share of full-scale designing in a 40-year career in aerospace engineering. Now I'm interested in small-size, but not brainless nor easy, technical projects.

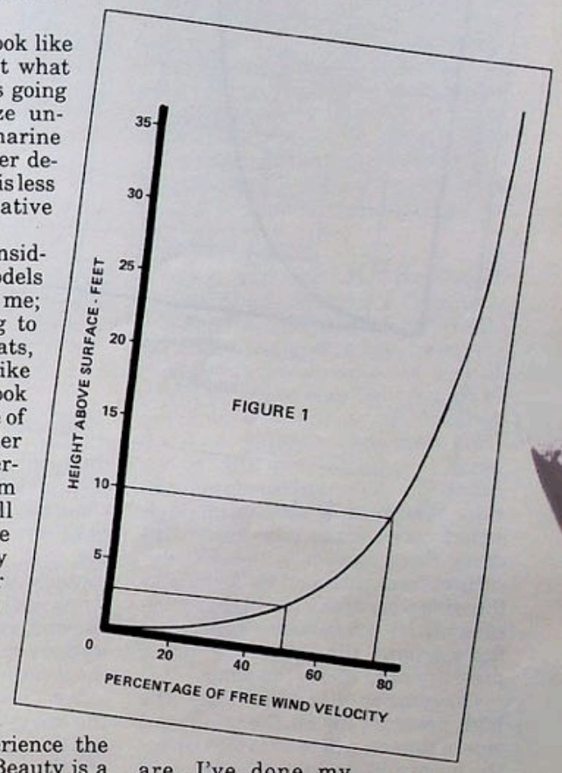


FIGURE 1

SAIL ASPECT RATIO

Some of you may not have thought about it, but airplanes and sailboats have much in common. Having an interest in both, I tend to use airplane terms in describing sailboat phenomena. Sailboat nomenclature is a voluminous heritage, but since it largely describes an ancient art, it lacks many words necessary to study a modern science. Aeronautics provides the missing words. Sorry if I belittle the traditions of a few old salts, but progress is inevitable.

Those of you with knowledge of airplanes as well as boats know that the longer and narrower the wings of

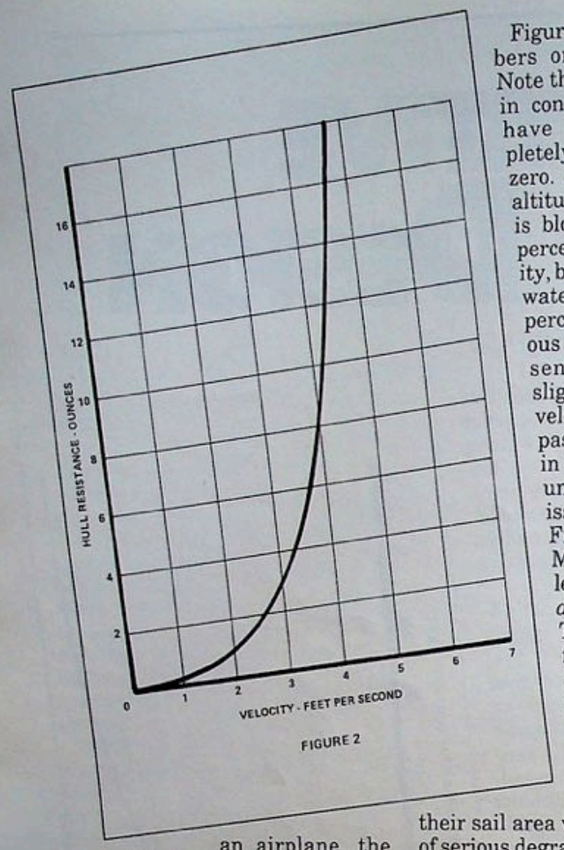


FIGURE 2

Figure 1 puts some numbers on the phenomenon. Note the air molecules right in contact with the water have been stopped completely for a wind velocity of zero. By this curve, at an altitude of ten feet, the wind is blowing at seventy-six percent of its "full" velocity, but at three feet off the water we have only fifty percent of our wind! Various authorities have presented similar but slightly differing wind-velocity profiles in the past, including Rod Carr in his "Strictly Sail" column in the March 1977 issue of this magazine. Figure 1 is from data in Manfred Curry's excellent old book, *The Aerodynamics of Sails*. This wind-shear profile tells me that model boats will be more efficient if they use higher aspect sails than full-size sailboats use. Big boats have most of their sail area well above the region of serious degradation of the wind, but our bitsy boats are right down in the worst of the problem. Raising the center of the sail area effectively increases the average wind velocity. Who says we can't do anything about the weather?

an airplane, the more efficient it is. These slim (high aspect ratio) wings have lower "induced drag," which is the drag resulting from the vortices formed at the wing tips, where the higher pressure air on the bottom of the wing flows around the tips to the lower pressure area above the wing.

The same applies to sailboats. The high pressure air on the windward side of the sail will tend to flow under the boom and over the top of the sail to the lower-pressure leeward side. The higher the mast the smaller this loss, percentage wise, and the more efficient the rig. BUT! In an airplane, if we make the wing *too* long it will be excessively heavy in order to be strong enough, and it will be less maneuverable, more expensive, etc. On a sailboat with an excessively high sail, some of these arguments apply, plus the serious matter of too much weight aloft and too much heeling moment in a blow. These would require excessive keel weight.

Another factor favors sailboats with tall sails, that of wind velocity profile. When the weather man gives us the wind velocity he means the velocity well above the surface. The land or water represents friction to the wind, so the lower we measure it the slower the wind is found to blow.

Don't raise the center of the sail by simply installing the same sail higher off the deck, however. That would worsen another loss, the tip-vortex flow under the boom. If you read my article on a wingsail boat a few months ago you may recall that in that design I swept the deck with the foot of the sail. There wonderful things happened. The effective aspect ratio of the sail theoretically *doubled*, the lower vortex was eliminated entirely, and the efficiency of the sail became very much greater because there could be no flow under the mast.

SAIL PLANFORM GEOMETRY

Sloop-rig sails are always triangular or nearly so. This shape evolved not because of aerodynamic efficiency but because of ease of construction, and ability to control the shape of the sail fairly well with a big boom. Also, the low center of area of the sail decreased the heeling moment and allowed narrower hulls, and smaller keel or ballast weight.

Except for the serious loss due to airflow under the boom, the efficiency of triangular sails isn't bad in full-scale boats. It is much worse in model sailboats because of the very much lower wind velocities near the water. If we could control the sail shape, model boaters would do better with rectangular-shaped sails, or even inverted-triangular sails with the boom at the top! That way we could get more of the sail area up to where the wind is beginning to blow.

All factors considered, if I was going to design another wingsail model boat I would make the sail rectangular, reasonably high aspect ratio, and most importantly, sealed against the deck.

The main reason why conventional sailboat booms are well above the deck is probably to prevent the boom from sweeping the crew into the sea

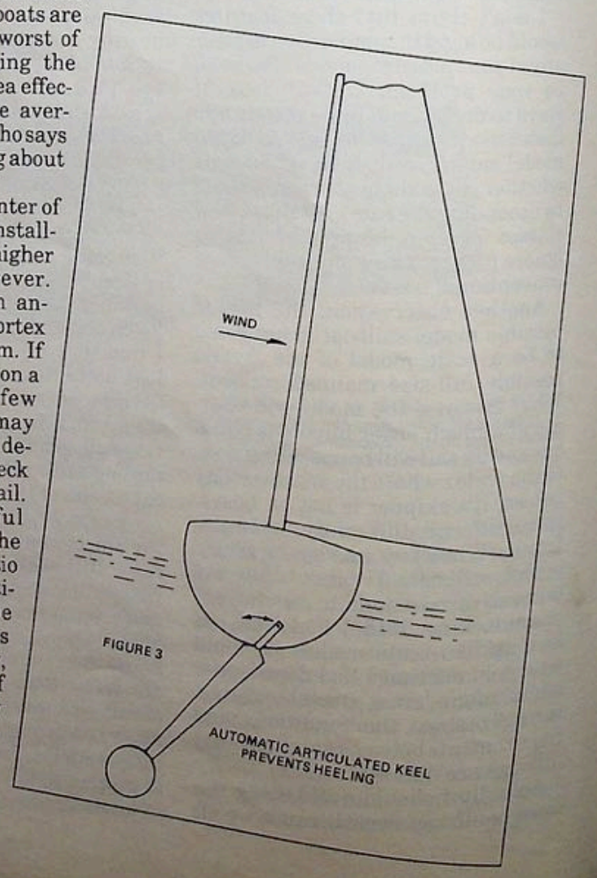


FIGURE 3

Figure 4. Automatic "Live" weight can prevent heel.

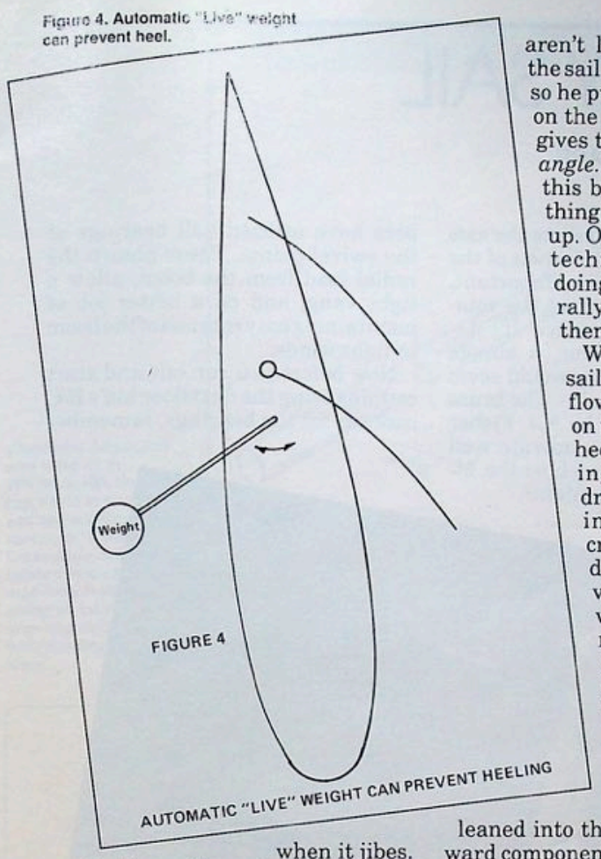


FIGURE 4

AUTOMATIC "LIVE" WEIGHT CAN PREVENT HEELING

when it jibes.

Earlier sailboat designers were ignorant of such technical matters as tip vortices. Model boat skippers don't have the danger of being lost at sea. You may use the space under the boom for a boom vang, but there are other ways of shaping the sail. Sealing the sail foot against the deck is probably the easiest way to make a big gain in sailboat performance.

Rod Carr pointed out in his March 1977 column that the wind velocity profile near the water should influence the way we allow or set the twist in our sails because the direction of the relative wind is going to be different at different heights on the sail. With a wingsail, the rig is stiff and cannot be twisted readily. If we built in a twist, it might help on one tack, but would be twisted in the wrong direction on the other. Nevertheless, a straight and rigid wingsail is far more efficient than conventional "floppy" sails. Floppy disks are "in," but floppy sails are "out" in my book.

LIFTING SAILS

In a good blow a sailboarder has to lean way back to keep from being dumped. It is similar to hiking on a small sailboat with little or no keel weight. The difference is that the sailboarder has nothing to hang on to but the articulated sail and his arms aren't long enough to keep the sail upright in a big wind, so he pulls the sail way over on the windward side. This gives the sail a *reverse heel angle*. The sailboarder does this because it is the only thing he can do and stay up. Only a few of the more technical realize that doing what comes naturally in this case gives them a big gain in speed.

When a conventional sailboat is in a blow, the flow is deflected upward on the sail due to the big heel angle. The resulting downward force drives the hull deeper into the water, increases its drag, and decreases the boat velocity from what it would have been with no heel. The heel also reduces the projected or effective area of the sail which further reduces the speed.

But a sailboard in a blow, with the sail leaned into the wind, has a downward component of flow over the sail which is helping to lift the board out of the water, reducing its effective displacement, and increasing its speed. Sailboards *move* in a wind.

Figure 5. Windmill Sailing Car.

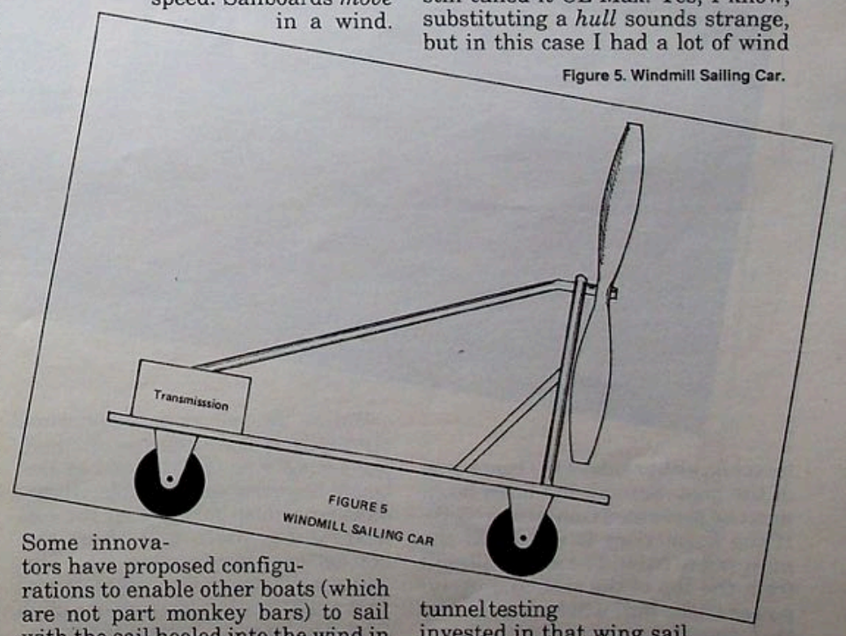


FIGURE 5
WINDMILL SAILING CAR

Some innovators have proposed configurations to enable other boats (which are not part monkey bars) to sail with the sail heeled into the wind in order to achieve this gain due to hull lift.

Of course, a sailboard is already well up on top when it is planing, but riding still higher due to sail lift will further reduce the drag (or "resistance" as you sailor types are apt to say). Lower drag, yes, but I find myself less sure about the speed. There is a side effect. When the sail is heeled into the wind the projected area of the sail on a vertical plane is reduced, the same as it is for normal heel. This factor will tend to *reduce* the drive on a boat with a normal high boom. On the other hand, if the reverse-heeled sail is sealed against the deck, the downflow couldn't escape and it would increase the drive.

Before one commits oneself to any novel design, an analysis should show a net gain under expected average sailing conditions. I'm not doing that job for you. I'm just the visiting expert (?) who is throwing out wild ideas. No guarantees expressed or implied.

CATAMARANS

"Stars and Stripes," the latest winner of the America's Cup, is a catamaran as well as a wingsail boat. For model sailboat racing, however, a catamaran is usually not a good choice. Cats are very light, which is one of the reasons they are fast, but that light weight makes them difficult to tack in some cases. I know because my first wingsail model racing boat, "CL Max," was a catamaran. At first it was, anyway. Later I substituted a conventional hull and still called it CL Max. Yes, I know, substituting a *hull* sounds strange, but in this case I had a lot of wind tunnel testing invested in that wing sail. The hull was the problem.

But I stray from my point. Cata-

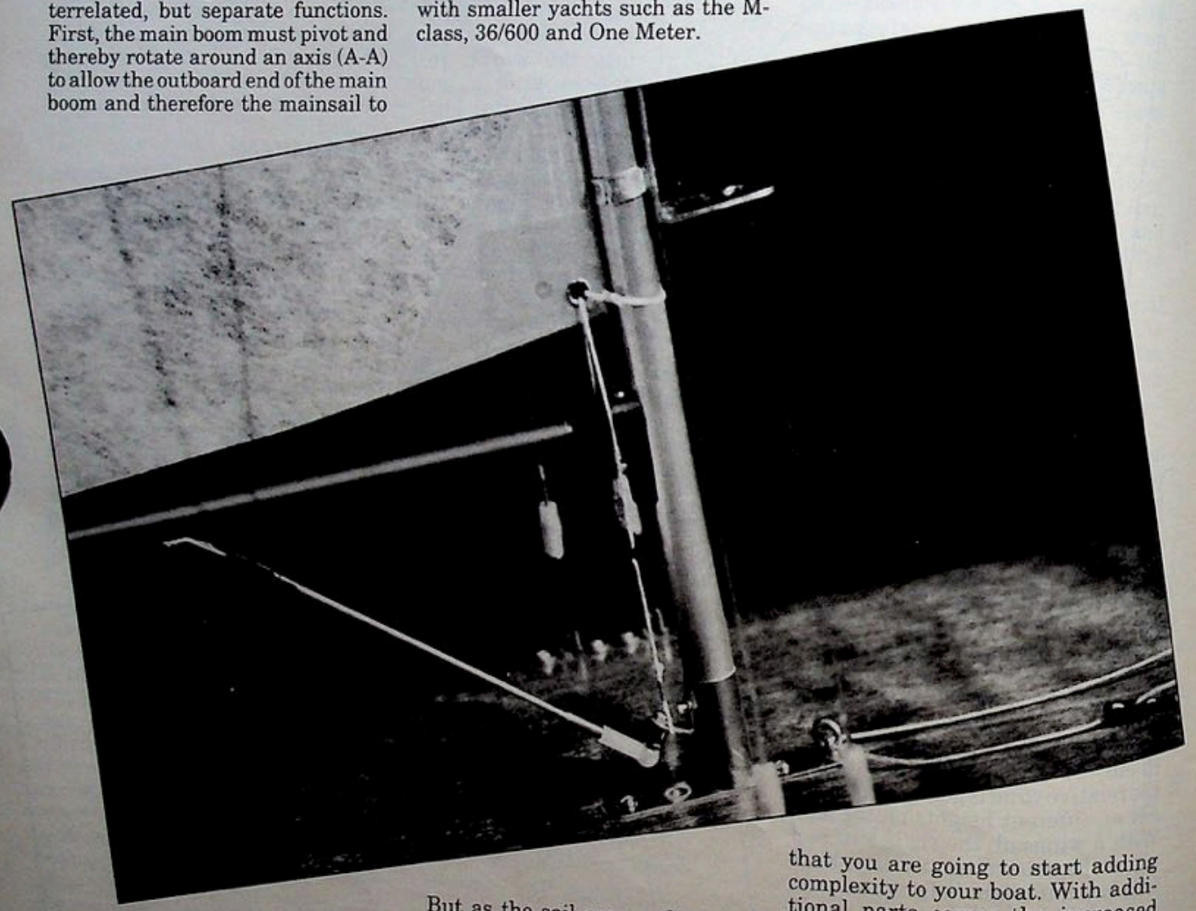
continued on page 66

STRICTLY SAIL

BY ROD CARR

Having spent a good deal of time on the function and geometry of the jib swivel, it is time to move back toward the center of the boat and look carefully at the other major rotational problem—the main boom, its gooseneck, and the associated vang.

In Figure 1, we see that the gooseneck/vang arrangement has two interrelated, but separate functions. First, the main boom must pivot and thereby rotate around an axis (A-A) to allow the outboard end of the main boom and therefore the mainsail to



be set on either side of the centerline of the boat. Second, the main boom must be prevented from rising (B-B). If the boom rises it will allow the mainsail to twist. The wind will spill from the top of the sail, and useful power to the hull will be lost. Notice that the action of the main boom rising (B-B) is parallel to the axis of rotation (A-A).

The forces which transmit themselves from the boom back to the axis near the mast make selection of the rotational mechanisms important. On the one hand we want the rotation (A-A) to be friction free. If rotation is considered alone, a simple axle and sleeve bearing would seem to be a reasonable choice. The brass goosenecks produced by A.J. Fisher are of this type. They operate well with smaller yachts such as the M-class, 36/600 and One Meter.

But as the sail area and/or wind strength increases, the magnitude of the lifting force on the end of the boom becomes considerable. It results in a push forward on the top bearing (C), and a pull aft on the bottom or vang bearing (D). The sleeves are now being asked to absorb a substantial sideways or radial load. The result is excessive wear of the axle, and ultimately a rotation which is neither easy nor even. To counteract this tendency, some skippers have utilized ball bearings at the swivel points. These absorb the radial load from the boom, allow a tight vang, and do a better job of maintaining easy rotation of the boom in light winds.

Now before you run out and start cannibalizing the next door kid's R/C race car for the bearings, remember that you are going to start adding complexity to your boat. With additional parts comes the increased chance for equipment failure. So pause for a moment and take a good look at Figure 2. In 2a, simple screw eyes are used to anchor the vang, with about four wraps of dacron sheet line used as the vang led to a cleat on the boom. The same mounting is used in 2b, but a single-ended turnbuckle makes for adjustment of the vang, and the setting is maintained by a locknut run down the turnbuckle threading to the body. If drilling all these holes in the bottom of the mast

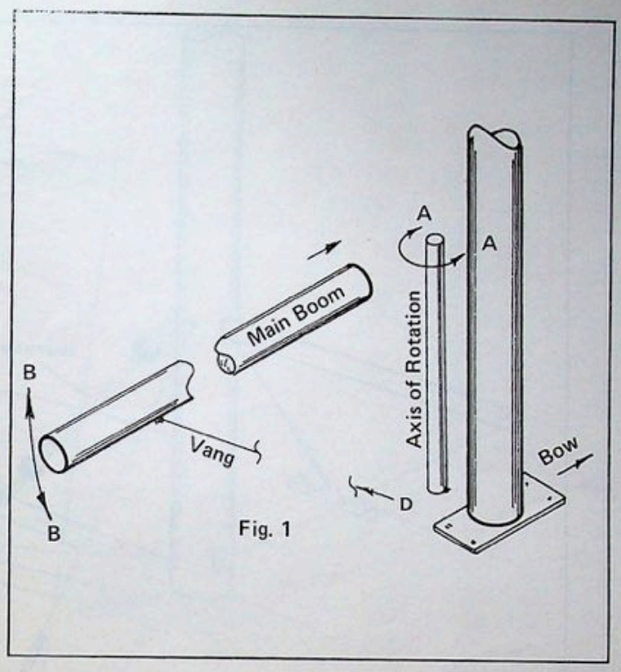


Fig. 1

(Opposite) Adjustable wire vang on Irl Whitten's 10R No. 39, has clevis at boom end and ball-and-socket connector at mast end. Brass angle bracket on forward side of mast is explained in Whitten's article on taking photos from your R/C boat, seen elsewhere in this issue.

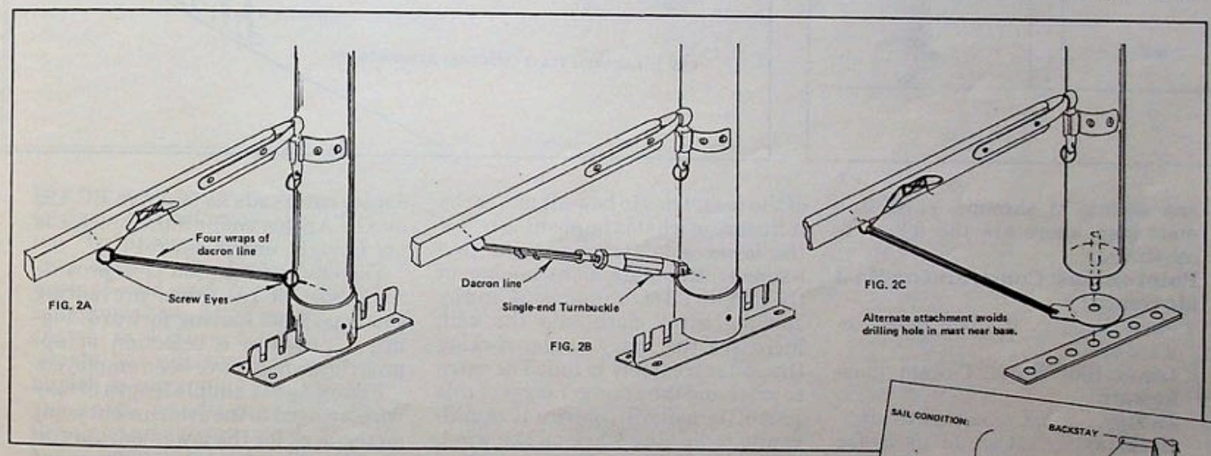


FIG. 2A

FIG. 2B

FIG. 2C

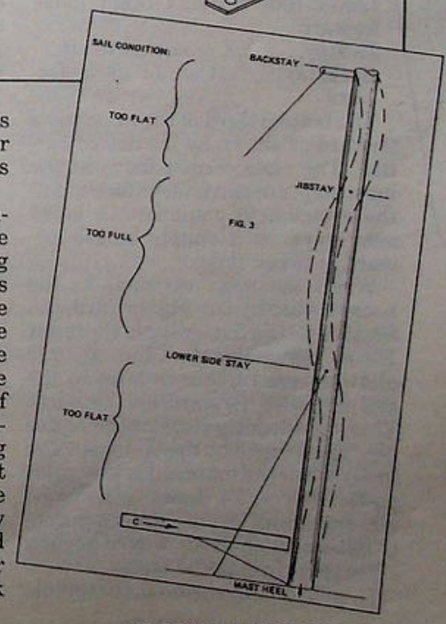
Alternate attachment avoids drilling hole in mast near base.

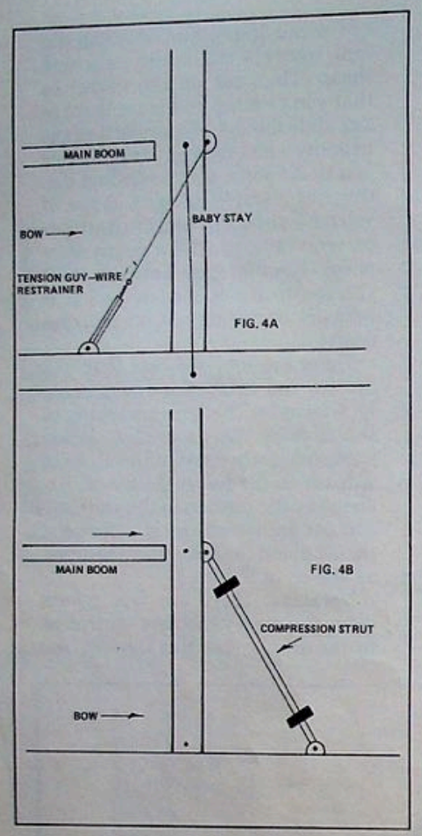
makes you nervous, 2c provides for a neat attachment point. Provision could certainly be made here for use of a turnbuckle if that is your wish. In all cases shown in Figure 2 I would recommend through-drilling the mast at the forwardmost pair of gooseneck mounting holes. Then use a 2-56 bolt and nut through the gooseneck and mast. The small wood screws usually provided don't hold very well in the soft cedar and spruce often used for masts, nor are they very trustworthy in the relatively thin wall of aluminum masts like the Goldspar or Pop-Up. Some skippers make the bottom six inches of the mast out of a hardwood which will hold the screws. Others drill pilot holes, run the screws in and out, then inject super glue or thin epoxy to saturate the area around the screws making it stronger. After the glue or epoxy cures, the screws are run in as usual.

As masts get taller and more limber, maintaining mast shape while sailing becomes the key to extracting power from the mainsail. There is one mast shape that you can see when sighting down the mast while the boat is lying on the ground. There may be a completely different shape to the mast when the sails are full of wind and the forces required for driving the boat forward are working their way from the sail to the mast and then to the hull. The shape of the mast while actually sailing is really the important one and is a very good reason for taking pictures of your boat while it is underway. Use black and white 35mm film. Develop the film yourself, it's really easy and cheap. Then cut up the negatives that you produce and place them in 2x2 slide mounts. By projecting the negatives and using a straightedge you make some very revealing discoveries about your mast shape. If you have put horizontal draft stripes on your sails, you'll also learn more about the differences between what you set up at dockside and what is actually occurring out on the race course.

There are lots of forces that will deform the mast. For the present let's focus on the forces working in the area of the gooseneck. When going to weather, the mainsail force will try to lift the main boom. Resisted by the tension in the vang, we are generally left with a forward thrust along the boom into the mast as shown in Figure 3.

Note that there are four points along the mast which are controlled by the deck or standing rigging. For





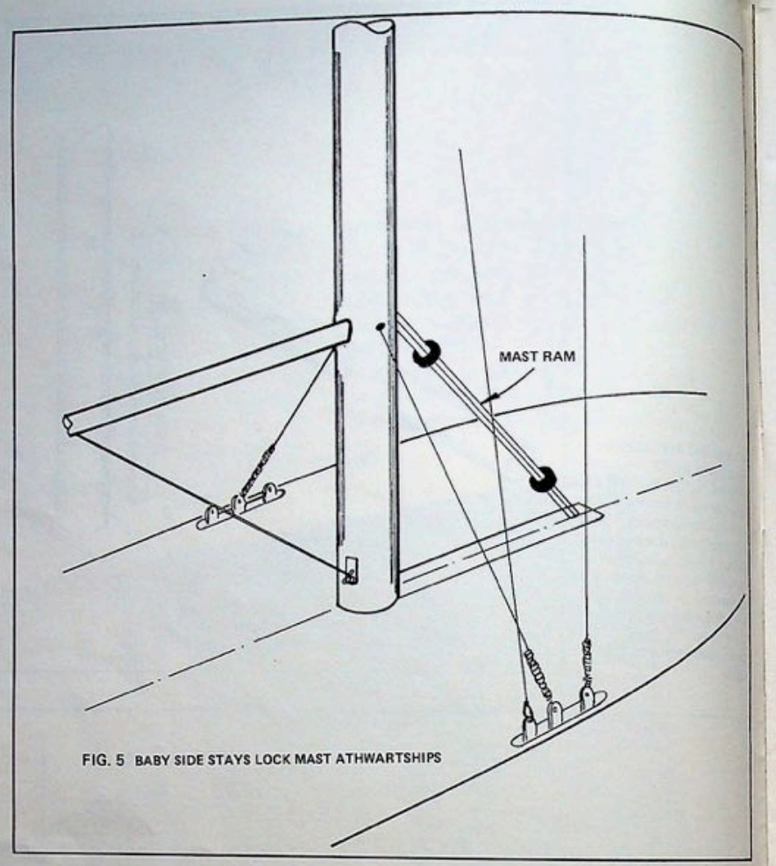


FIG. 5 BABY SIDE STAYS LOCK MAST ATHWARTSHIPS

any setting of shrouds, stays and mast step, there are the following constraints:

Point on Mast Constraint on Mast Movement

Mast Step.....Cannot move forward or aft

Lower Side Stay....Cannot move forward

Jibstay.....Cannot move aft

Backstay.....Cannot move forward

The bottom third of the mast bows forward as shown by the dotted outline. The mast cannot move at the mast step, nor can it move forward at the attachment point for the lower side stays, so it simply bulges forward between them.

When the mast responds to the boom thrust by bowing forward, the first result is a flattening of the lower 1/3 of the mainsail. Cloth that is allowing the camber to form in the sail is pulled forward by the mast. This significantly reduces the power being developed by the mainsail. The lower 1/3 of the mainsail is the major power source, for it can be trimmed for maximum drive while not contributing much in the way of heeling since it is close to the water.

Then in domino fashion, the middle of the mast tries to bow aft under the influence of what is happening below the lower side stay point. As this happens, this puts more camber in the middle 1/3 of the mainsail, and by shoving extra cloth into the sail, increases the entry angle, making the sail more likely to luff. The extra camber and the greater height of this part of the sail will contribute significantly to heeling when on the wind.

But the jibstay resists a continuation of the aftward bend, so the mast returns to its original position at the jibstay point, and then proceeds forward, only to be brought back by the tension of the backstay. The forward bow in the top 1/3 of the mast removes cloth from the head of the mainsail, flattens the entry angle, and results in less drive and more heel. The top of the sail is working in the highest wind velocity, typically 80 to 90% of what the Weather Service would report with a flow of 50% likely to be experienced somewhere about the middle of the sail.

The taller the mast (85-inch rig M-class skippers take note), the greater the impact on sail performance can be. Narrow chord sails can be severely perturbed by the removal of 1/32 of an inch of cloth. But even lower aspect ratio sails as found in EC/12s and STAR 45s suffer if the process is not brought under control.

The obvious solution is to provide some sort of restraint, preventing the mast from moving forward. Figure 4 provides a selection of approaches which have been employed.

Figure 4a is a simple length of stay wire, swaged to the attachment point on the deck for the lower sidestay on one gunwale, then over some sort of guide fitting on the front of the mast at gooseneck level, and finally to the other attachment point with a turnbuckle for tensioning. The tension in this "baby" shroud will be considerable, so make provision for double swaging sleeves.

Figure 4b is a commercially available fitting which acts in compression to form a solid strut between the mast and the deck. Space must be allowed for the jib club to swing through. The fitting needs to be very smooth so as to not snag a whipping jib sheet during a tack or gybe.

So far we have dealt with the fore and aft deformation of the mast as caused by main boom thrust. However, the main boom is rarely right on the centerline of the boat. When on a reach, the boom thrust will try to

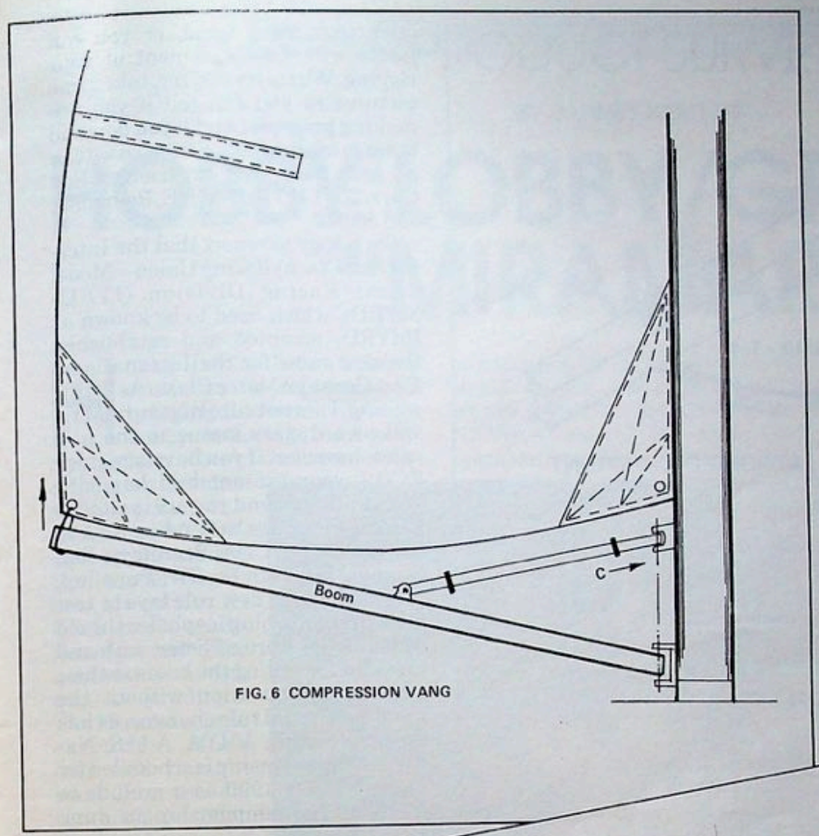


FIG. 6 COMPRESSION VANG

bow the mast not only forward, but sideways too. To prevent that, very short side stays made of solid stock have sometimes been fitted as shown in Figure 5. A simple but effective approach to controlling this unwanted bending and flexing is to make your mast out of enough material so that it is stiff enough to resist the bending forces which are forced upon it. It may be that a trade-off between slightly greater mast weight and greatly improved sail shape would provide a net increase in performance all the way around the racecourse.

Photo 1 shows a straightforward arrangement on Irl Whitten's 10-Rater. The ball link at the mast end of the vang allows the swiveling action for the vang as well as vang tension adjustment. How is the vang tension locked, Irl? And can you tell us how this works in strong winds? For those with the magnifying glass out, the bracket up the mast a ways is a mount for a small camera that Irl sends out on the race course for some excellent pictures of racing action.

COMPRESSION VANGS

In an attempt to lower the mainsail, reduce heel and gain the advantage of sealing off the foot of the sail, some skippers have experimented with a boom/vang arrangement as shown in Figure 6. The boom is pivoted near the foot of the mast. The vang is mounted above the boom and carries its load in compression. That is, as the sail tries to lift the end of the main boom, this vang "pushes" back. In so doing, the same force (C) is transmitted to the mast, in approximately the same position. So though this vang is working in compression rather than tension, an equivalent set of forces produces a thrust on the mast and all that we have discussed up to now applies.

Short of building a framework of girders and making the mast look like the Eiffel Tower, there are some alternatives for dealing with the disturbing results of uncontrolled boom or vang thrust.

One option is to physically separate the main boom completely from the mast. A robust axis needs to be erected slightly aft (6-10mm) of the mast. Some sort of outriggers will be needed to stabilize the axis in an athwartships direction and to transmit the thrust to the deck as in Figure 7. One might consider a tripod arrangement as shown, and provide for movement to match any adjustment allowed in the mast placement.

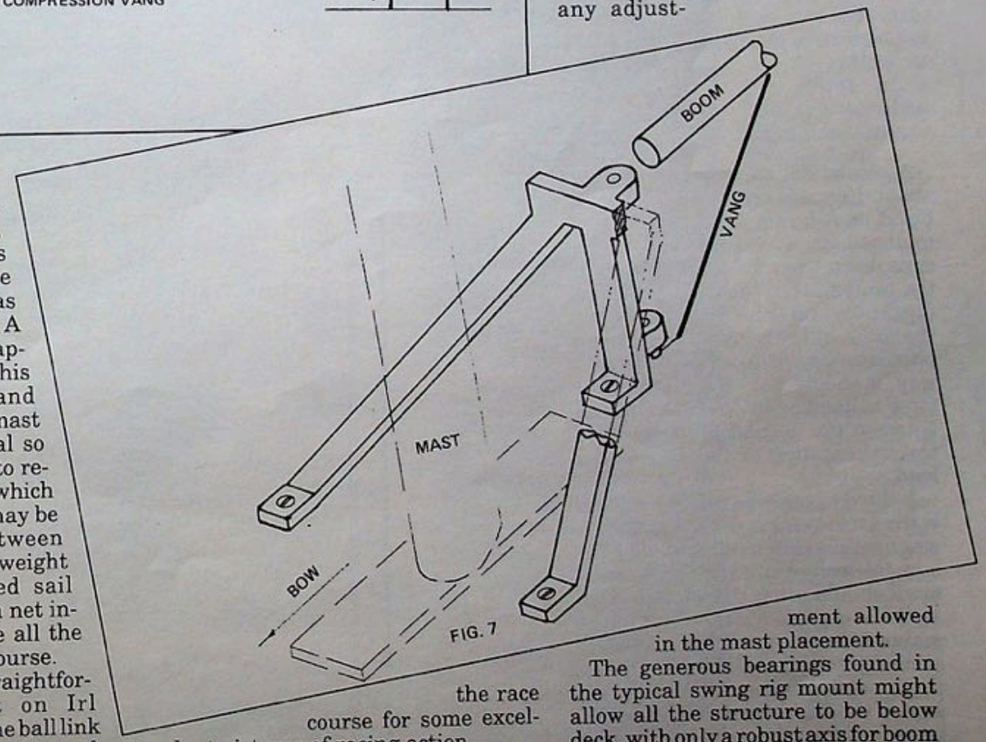


FIG. 7

The generous bearings found in the typical swing rig mount might allow all the structure to be below deck, with only a robust axis for boom and vang adjustment protruding as shown in Figure 8. The compression vang can be used if desired. The benefit with this configuration is simplicity, less clutter on deck, and the opportunity to build the assembly with sufficient strength for the class involved.

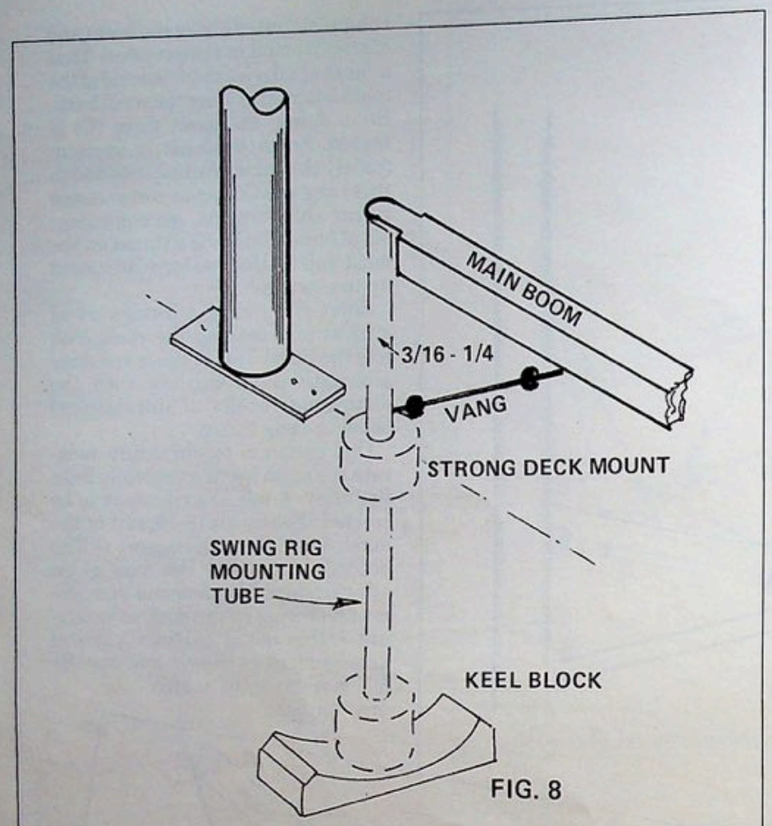


FIG. 8

A second option, which was tried about 10 years ago, was to erect a bipod or A-frame mast and set the mainsail on a vertical stay which runs down from the mast(s) head to the centerline of the deck. Tensioning the stay becomes a challenge, but the curve will be regular, and if some photographs are taken while underway, it should not take much effort for a sailmaker to do a good match between the desired luff curve and the deformation of the stay under load.

A third option one might consider is the arrangement of the mainsheet when sailing closehauled. Ideally, the last 1/4 inch of inward sheet movement should cause the vang to slack as the sheet takes all the load of the mainsail leech. At that time, there is almost a complete balance between the sheet tension and the leech tension. If the lead angle of the sheet can be in line with the sail's leech, there will be practically no residual force pushing the boom forward (see Figure 9). I don't recall seeing any boats rigged this way, so it might be something to experiment with a bit.

In summary, if you want to control your mast shape you can add fittings and gadgets, you can use a broomstick that won't bend, or you can fiddle with the placement of your rigging. Whatever you try, take some pictures so you can tell if you are making progress. And if you do, send them to me here at USBSM so we can all gain from your experience: Rod Carr, 3011 177th Ave. NE, Redmond, WA 98052.

I'm happy to report that the International Yacht Racing Union—Model Yacht Racing Division (IYRU-MYRD), which used to be known as IMYRU, accepted and established the new rules for the International East Coast 12 Meter Class. As of this writing, I am not sure that our AMYA will award class status to the new rules, however, if you have a regular EC/12, your present hull has been grandfathered and you are invited to join the new class by sending a $2.00 bill to the U.S. Class Secretary: Ron Banner, 115 17th St. SW, Puyallup, WA 98371. The new rule lays to rest all of the disturbing loopholes the old AMYA rules were afflicted with and provides for sailing the boats in their present configuration without the hassle of annual rule changes, as has occurred within AMYA. A U.S. National Championship is scheduled for August 25-26, 1990 as a prelude to the World Championship in June 1991 in Seattle. •

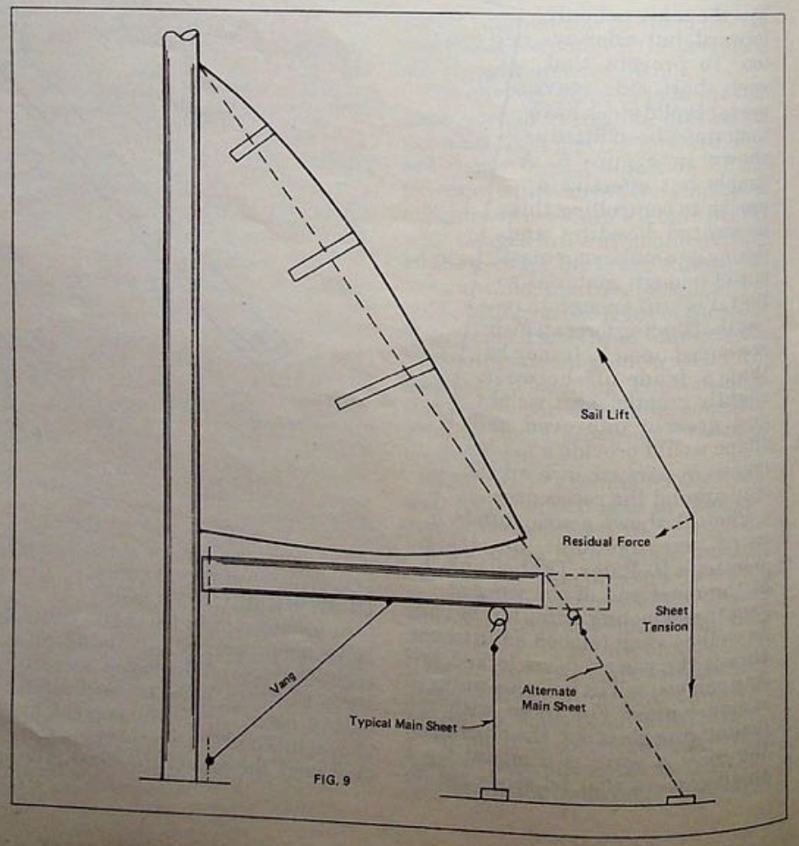


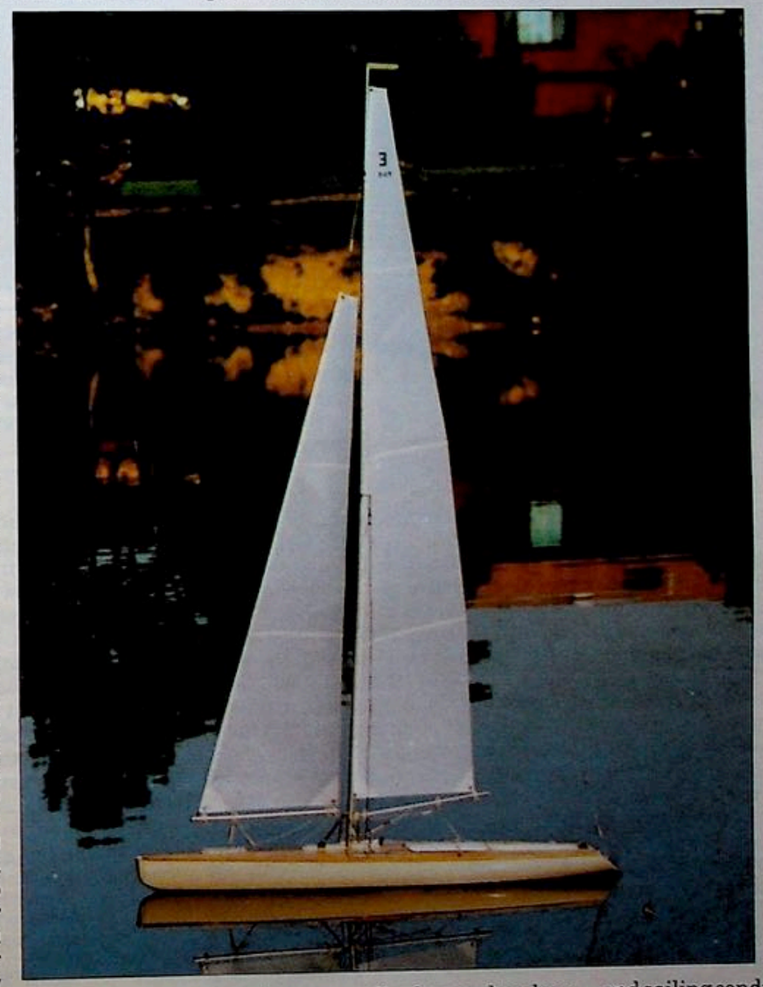
FIG. 9

PRODUCT SURVEY

BY BARNEY KEMTER

HOBBY LOBBY/GRAUPNER "MIRAMARE"

Hobby Lobby International continues its reputation of bringing fine quality foreign hobby products to the American modeler. One of their recent additions is a German sailboat kit, the "Miramare." Produced by Graupner, this model *Segelboot* kit carries on Graupner's tradition of providing the hobbyist with high quality products. The Miramare is no exception. Much care and thought went into the design and production of this European One-Meter class sailboat. There are numerous design features on this boat that one does not normally see on a model sailboat produced in the United States.



In Eastern Europe, model sailboat racing is governed by an organization known as NAVIGA. In America, model yacht racing is governed by the American Model Yacht Association. The powers that be at NAVIGA recently decided to replace their earlier "X" class boats with a new One-Meter class. That is, new to Eastern Europeans. Americans have enjoyed a One-Meter class for several years. NAVIGA's goal was to create a new class of models which would not only be simple to build and transport, but would also attract newcomers to sailing. They also desired that models in this class be capable of providing excellent performance that would ensure action and exciting regattas. With these desires in mind, NAVIGA created the class F5-E specifications. Since the One-Meter class is an exceedingly popular class in America, it comes as no surprise that the NAVIGA F5-E specifications are very similar to the AMYA One-Meter specifications under which many of us compete. One major difference from the AMYA specifications is the Europeans' requirement of a minimum ready-to-sail weight. Under AMYA rules there is no minimum weight. The winning One-Meter class boats in the United States are now in the six to seven pound range! Another difference found with the NAVIGA specifications is the mandatory use of a bow bumper that is at least 10mm thick. The Miramare features a molded rubber bumper that protects your boat, as well as others, in the event of a skipper's miscalculation during a tacking duel.

For those modelers who enjoy building a model that combines the use of synthetic materials for the hardest part of a project, and wood for the classic appearance of a boat, the Miramare combines the best of both features. This kit is within the capability of the average model builder. It features a molded ABS plastic hull for ease of assembly and greatly reduced building time.

Graupner has designed this boat for European winds and sailing conditions. Sailing conditions are generally more robust on the other side of the "pond" than in the United States. This boat is designed to handle heavy winds. To handle the greater stresses placed on the boat, internal diagonal bracing is built into the craft. The jib rack

"Hey, Mister. Would you mind getting your sailboat off my roof?" Or should we say, "This flooding has to stop. My feet are getting wet!" Wait a minute! What's going on here? Is it a double exposure? If you can't figure it out, you'll just have to read the article. *SOMEWHERE* in there, it'll tell you what's going on!

mounting area is braced to the bottom of the hull to distribute the tension placed on this area. The mounting area for the mast is likewise internally braced to distribute the compression forces generated by the rigging pushing the mast down against the deck. In short, this is one fine *Segelboot* that is engineered and designed by German craftsmen.

There are numerous design innovations incorporated into this boat. If any criticism about the kit is to be made, it must be that the boat is overly designed, engineered, and constructed for the type of winds encountered at most One-Meter regattas held in the U.S.

Constructing the Miramare was a most enjoyable and challenging experience. I found the quality of the wood and die cutting to be superb. All parts and rigging are of excellent quality. Experienced model yachtsmen will readily recognize the quality of the hardware and fittings supplied as standard items with this kit. As with all Graupner kits, the plans are written in German and the dimensions are given in the metric system. This did not present any problems as the plans consist of four large sheets of drawings and instructions. Together, these plans consist of 44 square feet of some of the most detailed plans that you will ever encounter! That's enough paper to cover a wall of a small room! One of these sheets is an English translation of all the building sequences used in constructing this fine craft. Two of the sheets are full-size drawings of the boat. All parts are numbered and shown on the plans. In fact, over 300 parts are used to construct this boat. That's counting all the screws, nuts, and washers!

I taped the two drawings to a wall in my shop and did most of the assembly from studying the plans. When I got stumped, I read the English instructions. I did not encounter any areas that required getting out my German/English dictionary, but I did discover one error on the plans. One step in the construction of the cockpit subassembly calls for a single block or pulley to be mounted on the starboard side of the cockpit. One illustration shows this block on the starboard side of the boat. Another portion of the subassembly plans shows the pulley mounted on the port side of the cockpit. From my experience building this boat, and from studying the photograph on the kit's box, the single block (pulley) is to be installed on the *starboard* side of the boat.

If you have experienced model yacht racing in eastern Europe, you will be familiar with many of the unusual features found on the Miramare; if not, let me point out some of these features. The first major difference between American and European yachts is that the Europeans seem to favor the use of a drum winch for their sail control. As I was building this kit to original specifications, I chose to use the recommended Graupner *Segelwinde* for my sail control. The *Segelwinde,* or sail winder, is an extremely powerful drum winch. I disassembled the unit out of curiosity and desire to learn what made this device work. I was most impressed with the precision internal planetary gear reduction system and adjustable end point trim pots for limiting the amount of line travel. Designed to operate on a separate battery supply of 4 to 9 volts, I chose to use a separate 5-cell Ni-Cd pack. With a 6-volt power supply this winch was capable of pulling in the sails during the heaviest of weather conditions. I also tried powering the winch with the receiver battery pack. Performance was satisfactory. In this configuration, sailing time was reduced due to the increased drain on the receiver battery pack. When operated on a separate 9-volt battery pack, this winch has unbelievable speed and power. When I build another large yacht I will be using this winch for the sail control.

Another interesting feature of this yacht is the method of mast attachment. This boat uses a short section of the mast (stub mast assembly) that is mounted to the deck and supported with a tripod arrangement of rigid stays and turnbuckles. This arrangement allows the European racers to change sails quickly during a race. The completely rigged mast, with sails attached, slips onto the short stub mast assembly. This allows for fast setup and quick changing of sails. An outstanding feature of this arrangement is that there is a large turnbuckle from the mast to the deck. This turnbuckle permits the yacht owner to tune the boat for various wind conditions. By adjusting the turnbuckle, one can change the shape of the mast and affect the shape of the sails. I have never seen a boat that has flexibility and adjustments for tuning as that offered by the Miramare.

After sailing the Miramare in all kinds of weather, I have but a few criticisms of the yacht. In heavy winds, I would prefer to see more weight in the keel. The torpedo-shaped lead bulb provided with the

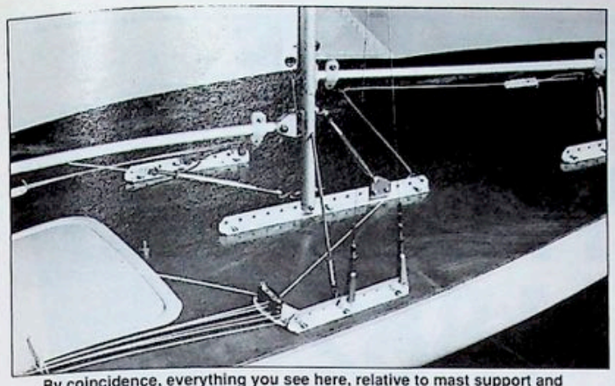
continued on page 72

COMPARISON OF CLASS SPECIFICATIONS

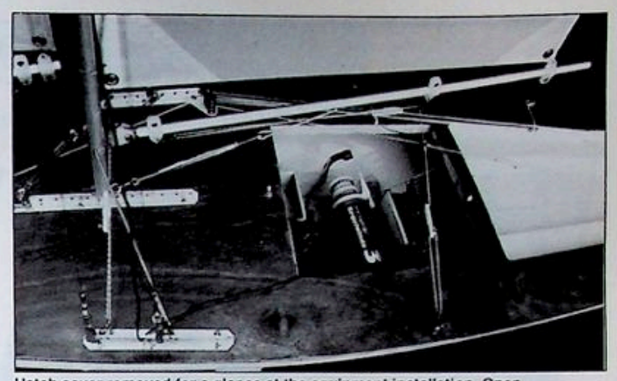
	AMYA	NAVIGA
Length:	39" to 39-3/8" 1000mm	1000mm Max
Bow Bumper:	Not Required	10mm thick
Mast Height:	65" max. *ES* 1651mm	1650mm *ES* 64.96"
Mast Diameter:	Maximum 3/4" *ES* 19mm	Maximum 20mm
Sail Area:	600 sq.in. *ES* 0.387 sq.in.	0.4 sq. m. *ES* 620 sq.in.
Keel Length:	14.25" *ES* 361.95mm	360mm *ES* 14.17 in.
Weight:	No Minimum	>1700 g. without keel (3.75 lbs. without keel)
Controls:	Not specified	2 functions—rudder and one sailwinch

SPECIFICATIONS OF Miramare AS BUILT

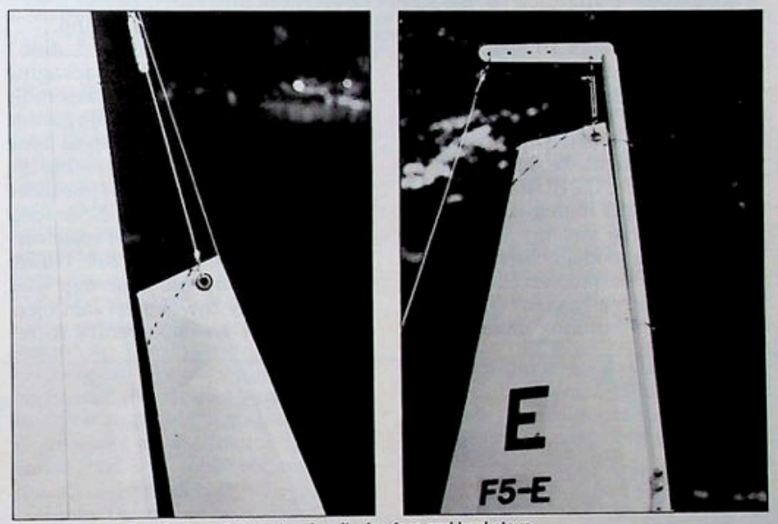
Length	1000mm
Beam	246mm
Height	1560mm
Sail area	0.39 sq. m.
Weight of keel	1700 g.
	39-3/8 in.
	10 in.
	61.4 in.
	598.88 sq.in.
	3.75 lbs.



By coincidence, everything you see here, relative to mast support and bracing, is discussed in detail in Rod Carr's "Strictly Sail" column in this issue. Grain in the natural finished ply deck lends a classy touch.

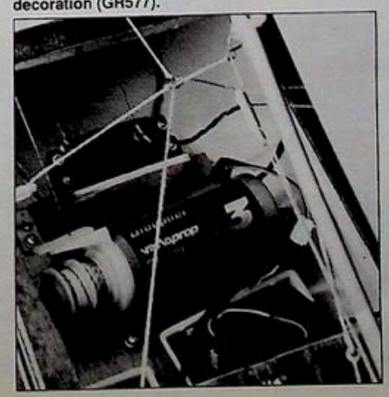


Hatch cover removed for a glance at the equipment installation. Open cockpit helps the scale appearance.



(Left and right) Top rigging of jib and mainsail, also fore and backstays.

Close-up of rudder and sail control servos. Sailwinch is the Graupner GR3771, an optional extra available from Hobby Lobby. Also available is a Cabin and Rail Set for additional scale decoration (GR577).



PRODUCT SURVEY

BY JERRY DUNLAP

HOBBY DYNAMICS' "CESA 1882"

Hobby Dynamics, a leading hobby distributor located in Champaign, Illinois, recently added the electric powered Offshore Racer CESA 1882 to its product line. When our editor/publisher, Bill Northrop, inquired whether I might be interested In doing a PRODUCT SURVEY on this boat, I thought it might be a good opportunity to get my son, Paul, involved in a model boating project.

Although Paul is an excellent model boat racer, he really hasn't done much in the way of building model boats. He has, however, built a couple of R/C offroad vehicles and even managed to keep them in a somewhat semblance of running order. In my opinion, assembling plastic electric boats more resembles building an R/C offroad vehicle than building a model boat. All in all, it seemed like a good project for Paul to lend a hand.

When the boat arrived, I didn't bother taking it out of the packaging box since Paul was going to assemble it. Paul took the box out to the garage to remove the boat. He came back shortly to ask if I realized how big the boat was? He then brought the three foot long, bright orange CESA 1882 into the family room. This scale version of the 1988 and 1989 U.I.M. Offshore World Championship boat was definitely the longest fast electric I've had an opportunity to review.

The CESA 1882 and JR Alpina 2-Channel PCM on a snowy blanket in Tacoma, Washington. Weather does not always cooperate with timely reviews of new products!

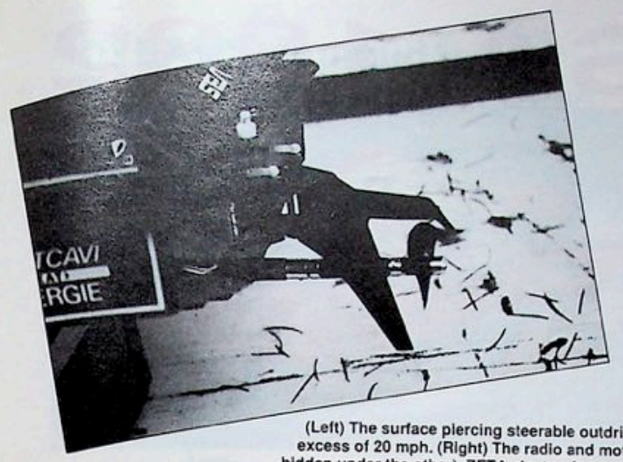
The CESA 1882 model has a couple of features worth mentioning. The hull and deck of the CESA are factory joined, eliminating any gluing of plastic parts. The propulsion system features a twin motor gear drive unit coupled to a surface piercing, steerable outdrive. A surface piercing drive system differs from a typical model outdrive system. In the surface piercing drive system, the drive shaft exits the transom at the bottom of the vee. A typical model outdrive system employs a strut which extends below the bottom of the boat. This power unit mounts directly to the transom which is not the typical method for electric motor installations.

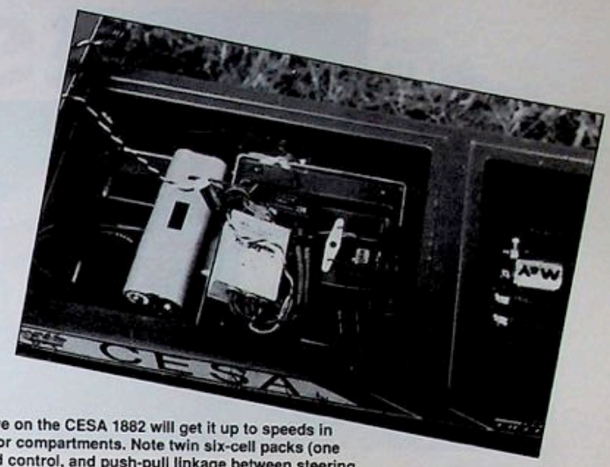
The decal set provided is so complete it takes about as much time to peel, stick, and trim as it does to install the drive and radio systems. One feature of the boat I really appreciated was the waterproof radio and motor compartments. By using sealing tape, included in the kit, water is kept where it belongs... in the pond.

The assembly instruction booklet provided with the CESA 1882 is typical of the written directions and illustrations one usually sees with offroad vehicles. Matter of fact, pages 4 and 5 showing the assembly of the drive system, look like they were transposed from an offroad assembly manual. Knowing my son, he probably put all the parts together by looking at the diagrams. I think the only thing Paul reads is the menu at McDonalds. He really likes ordering at the Colonel's Place because he can look at the pictures. *(OK, Jerry. We're going to give Paul equal space for a rebuttle... that's free back-talk, Paul... wcn)*

One area to give special attention is attaching the motors to the motor mount and adjusting the gear backlash. Paul originally set the motors too tight against the main gear. Just attempting to turn the propeller showed something wasn't right. The drive system was removed and the gear backlash increased slightly allowing freer movement.

A wiper speed controller featuring variable speeds forward and backward is included with the CESA 1882.





(Left) The surface piercing steerable outdrive on the CESA 1882 will get it up to speeds in excess of 20 mph. (Right) The radio and motor compartments. Note twin six-cell packs (one hidden under the other), ZETA electronic speed control, and push-pull linkage between steering servo and outdrive. The twin M&Y 700RST motors are coupled to a 2:1 reduction gearbox.

However, we elected to go with a PDI Zeta electronic speed control, as this unit will easily handle the twin six-cell packs I planned to use to supply the power. This also allowed eliminating the throttle servo and receiver battery pack, as the electronic speed control has BEC (battery eliminator circuit).

Paul took care of installing the drive system, application of decals, mounting the steering servo, and hooking up the steering linkage. I connected the jumper harness wires to the motors and installed Sermos Connectors on the motor leads because Paul had these connectors on his offroad vehicle.

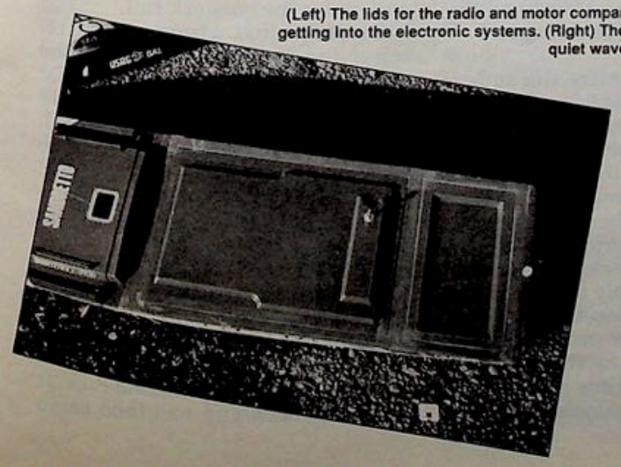
Hobby Dynamics provided us with a JR PROPO 2-channel ALPINA PCM radio system for this project. Eloy Marez, our publication's resident electronics expert, wrote a column about the advantages of a PCM radio system about a year ago. PCM stand for pulse code modulation which refers to the type of radio wave the transmitter emits. The PCM system provides a better signal and is less susceptible to interference.

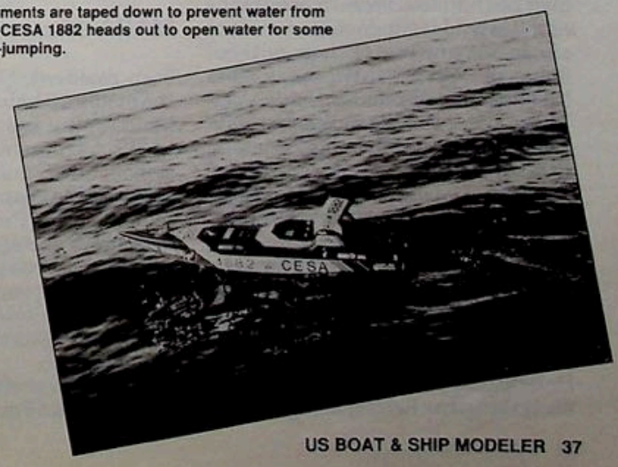
An interesting feature of the ALPINA PCM is the built in failsafe. This allows the throttle servo to be preset to return to a low or off throttle setting if the receiver loses the transmitter signal. Since this feature is stored in the receiver, it worked with the electronic speed controller we used with the CESA 1882.

Attempting to get a suitable day to try out the CESA 1882 and snap some running photos proved to be a real challenge. Due to some really challenging (read that crummy) weather conditions in late January and early February it seemed like I'd never have an opportunity to get the CESA 1882 wet. When I had the time to run the boat it was either raining, blowing at a gale force, or doing both at the same time.

When it became apparent I'd have to brave some adverse weather or possibly wait until August to get some photos, I elected to go with wind only. I took Paul along to take some photos of what happens when you run the boat in a 20 mph south wind. It turned out there was another problem be-

continued on page 73





(Left) The lids for the radio and motor compartments are taped down to prevent water from getting into the electronic systems. (Right) The CESA 1882 heads out to open water for some quiet wave-jumping.

CESA 1882

Weight ..... 4 lbs
Overall length.... 40.35"
Hull length ..... 36.25"
Width..... 8.66"
V-angle ..... 18°

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BOOKS *Continued from page 9*

Each of the three later books covers a specific region of the Yangtze in more detail. The books are similar in arrangement with an introduction to the geography and maritime history of the area followed by monographs of specific local vessel types. The monographs vary from one to several pages each, with a discussion of design and use. Nearly all are illustrated in some way and most have multiple plan views drawn by the author. The three books contain well over two hundred vessel monographs and it would be impossible for me to single out any one of them without doing an injustice to the many other excellent and fascinating junk types. They range from War Junks to Coffin Barges to Grain Grinding Boats to Pirate Vessels and Beggar Tubs. There is even one intended for those who wish to drown themselves!

The junks themselves are fascinating, but so are the traditions and stories that go along with each. Mr. Worcester makes full use of the opportunity to pause from a monograph to cover a related subject better. Delightful sections can be found on such things as fishing using trained otters, great explorers, the trade in and proper cooking of ducks, local legends, and the exploits of Chinese Royalty.

Worcester himself admits that the China he came to know and wrote about was one which had yet to experience the upheaval of the Second World War and the uncountable changes that came after. Even so, he was able to preserve for us the maritime heritage of the Yangtze with a depth that has not and may never be approached by another author. •

MARA *Continued from page 16*

been removed. Cement the ends of the mounts firmly to the underside of the coaming and, when dry, remove the Probar assembly and apply more cement all around the mount attachment to the coaming. Let dry overnight. Cut the Probar arm to length, drill holes as required, and bolt the arm to the Probar mechanism. Bolt the Probar assembly to the mounts. Solder the switch wires to the correct battery wires as shown on the wiring diagram.

The receiver shelf is cut to shape, assembled and cemented securely to the coaming.

The switch is mounted on plywood and wiring is soldered to the terminals. Cement the plywood to the deck and bulkheads in the forward hatch.

The receiver battery compartment can be lined with 1/8-inch balsa if desired to keep the battery from shifting. The battery assembly should fit snug but not tight. We stuffed sponge rubber on each side of the battery to keep it from shifting, instead of the balsa lining.

The antenna wire can be spot-cemented around the cabin coaming and under the bulwark rail.

Connect servo wiring to the receiver and check the operation of the equipment and we are then ready for the rigging and sailing. The receiver battery wiring to the receiver will require a wiring extension in order to reach the receiver.

LIST OF MATERIAL

(All material is medium balsa unless noted otherwise.)
(20) 1/8 x 1/4 x 36 for hull planking
(1) 1 x 2 x 36 for bow and stern blocks (laminated)
(2) 1/8 x 3 x 36 for deck, cabin and cockpit sides, coaming, and hatch
(1) 1/2 x 2 x 36 for cabin and cockpit enclosure ends and roof, and servo foundations
(6) 1/8 x 6 x 12 birch plywood for keel, bulkheads, rudder and servo mounts
(1) 1/2-inch sq. x 9 inch hardwood for bowsprit
(1) 1/4-inch dia. dowel for main and mizzen booms
(1) 3/16-inch dia. dowel for foresails boom
(1) 1/2-inch dia. dowel for main mast
(1) 3/8-inch dia. dowel for mizzen mast
(1) 1/8 inside dia. x 12-inch brass tube for propeller shaft tube
(1) 16 oz. bar plumber's lead for ballast
(1) 1/8-inch dia. x 12-inch brass rod for propeller shaft
16 ounces Pactra Balsa Filler Coat
8 ounces Pactra Swift White Dope
4 ounces Pactra Stearman Red Dope
4 ounces Pactra Curtiss Blue Dope
2 ounces Pactra Jet Black Dope
4 ounces Pactra dope thinner
(3) A.J. Fisher No. 218 brass cleats
(12) A.J. Fisher No. 567 brass tangs
12 inches of A.J. Fisher No. 440 black brass chain 11 links per inch
30 feet of 20 lb. test fabric fish line
(4) A.J. Fisher No. 105 brass working blocks
(1) A.J. Fisher style F-530 gooseneck (open end)
(2) A.J. Fisher style D-531 gooseneck (open end)
(12) A.J. Fisher No. 225 brass air ports 3/8 inch with lights (clear plastic lens)
(3) Williams Bros. Nylon Hinges No. 106
(1) Aristo-Craft RC-360G-3265 electric motor
.032 x 1/2-inch aluminum strip to hold motor against motor mount
Aristo-Craft M-232-15 spring type universal joint
Dumas P-49 Nylon propeller
1 foot of 1/4-inch copper tubing
Black carpet thread
Coarse, medium, fine and extra-fine sandpaper
1 x 2 x 3-inch sandpaper block
Large tube of Ambroid cement
Assorted brass wood screws and straight pins
.045 brass wire
Sig Nylon control horn for rudder tiller
A.J. Fisher M-29 cast metal bow light
Lafayette No. 99-62184 push-button micro-switch.

MASTS AND BOOMS

These are cut from straight-grain hardwood strips or good quality dowel. Trim and taper gently, cutting a little at a time. The final shaping should be done with coarse, medium and then fine sandpaper wrapped around a block. When sanding the masts and booms, they should lay flat on the worktable so that pressure can be applied without the danger of breaking. In addition, it will be found that a more accurate taper will be easier to achieve. Themasts are tapered at the top and a step is carved into the bottom of each.

The booms taper very little and are rounded at the end, as shown.

Drill the necessary holes in the completed booms and masts and then seal and paint them tan. The sheet brass vangs and cleats can be made or purchased. Bend as necessary and hold in place on the masts with small wood screws in pilot holes and cement. Attach the goosenecks to the masts, booms and bowsprit with screws, and cement.

Trial fit the masts in the holes in the deck, being certain that the stepped bottom fits into the hole in the mast support. Check the mast alignment and correct as needed by sandpapering the hole in the deck with the sandpaper wrapped arounda dowel. When the fit is good and po-

continued on page 50

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U.S.C.G. photo

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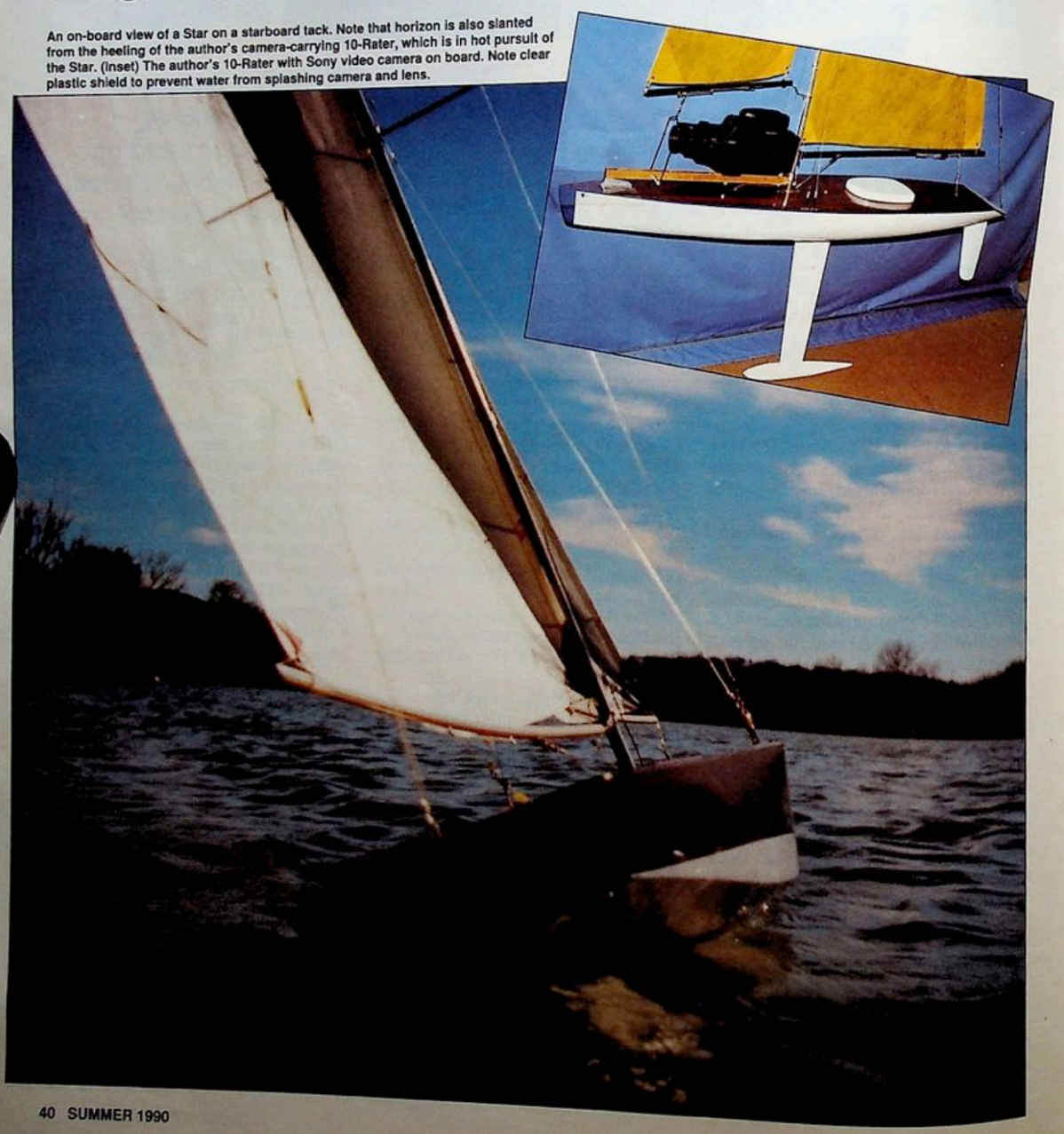
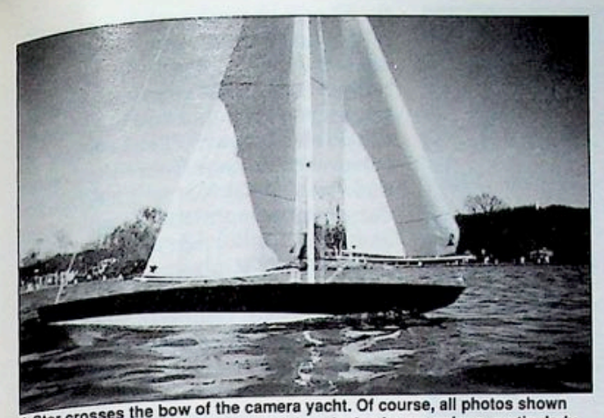
BY WILLIAM WHITTEN

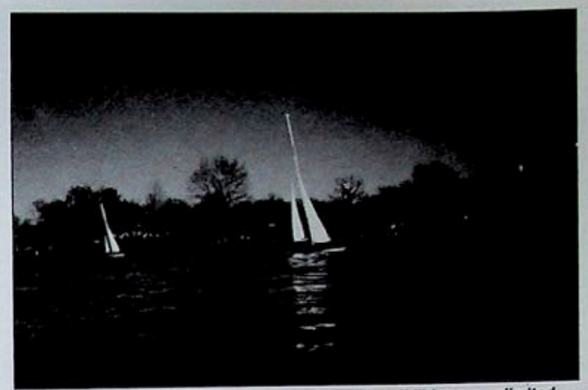
R/C YACHT CAM



An on-board view of a Star on a starboard tack. Note that horizon is also slanted from the heeling of the author's camera-carrying 10-Rater, which is in hot pursuit of the Star. (Inset) The author's 10-Rater with Sony video camera on board. Note clear plastic shield to prevent water from splashing camera and lens.



A Star crosses the bow of the camera yacht. Of course, all photos shown here were taken with still camera. Video playbacks are unique, particularly during jibe and tacking maneuvers!



Only slight heeling when this photo was taken. Possibilities are unlimited. Great photos can also be taken from electric powered boats, such as R/C tugs.

Have you ever wondered what it would be like to be on your model yacht as it sails gracefully across the pond? You can't really be on board, but you can get an idea of what it would be like by taking photographs with a camera mounted on the boat. The right camera angle puts you in the center of the action for photographs you can't get any other way. If you are interested in model yachting and photography, here is how to combine them in a unique way.

There are literally hundreds of cameras out there to choose from, in both the still and motion picture varieties. No single brand or model is best, but the size of your boat will limit the weight of the camera it can carry.

STILL CAMERAS

In general, a 35mm camera is the one to go with. The larger formats are too heavy and smaller ones usually don't produce good photographs. Do yourself a favor and don't waste money on a cheapie... use a decent camera from the beginning.

If you have an SLR with motor drive and all the fancy features, by all means use it... with a normal or slightly wide angle lens you should get excellent photographs. If you don't have one, or prefer not to risk it on the water, one of the under-$50 "point and shoot" models will do nicely. With print film and plenty of sunlight, they will produce photos of good quality. If you prefer slides, you will need the SLR or one of the higher-priced 35mm compacts with automatic exposure. Whatever you use, an automatic film advance is a must.

MOTION PICTURE CAMERAS

Here we have two main choices film or video. Film will be limited to Super 8, which has been made obsolete by video, so there are plenty of used cameras available at nominal expense. Check with friends, neighbors, or second-hand shops. You want a small, light model with the motor run by batteries rather than a spring mechanism. Make sure it has a tripod mounting socket. The main disadvantage to Super 8 is the high cost of film. A 50-foot roll lasts only about three minutes and costs $10-12 including processing. Sound film is even more and requires a special camera. Film does have better image quality than video and can be edited, but the costs add up pretty quickly. Video is the better way to go.

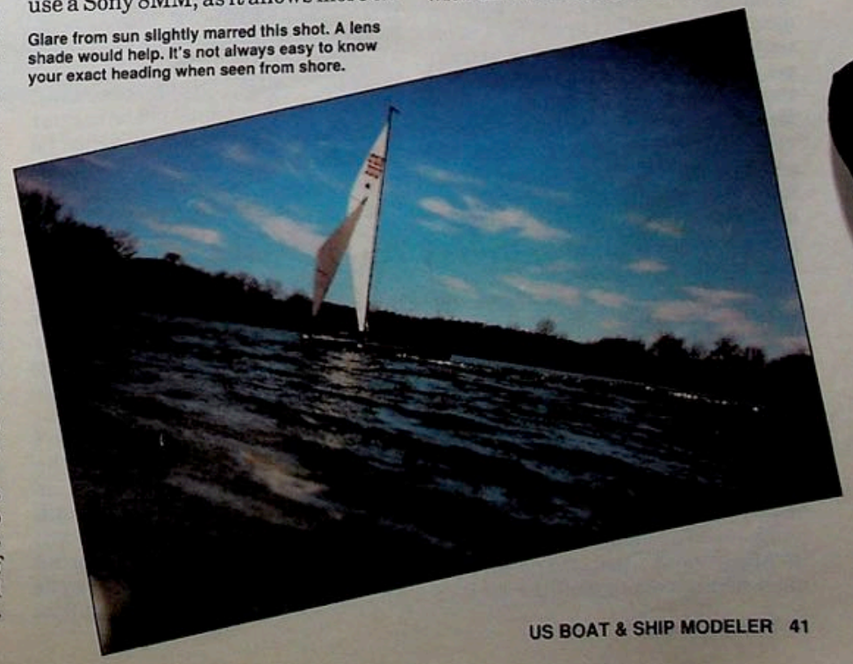
VIDEO

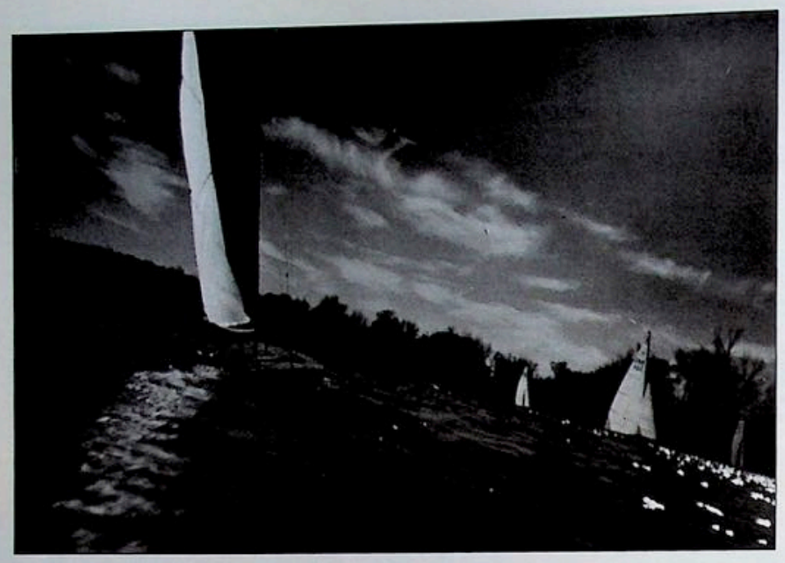
Here you have a choice of several camcorder formats. Beta or full size VHS are too large and heavy for any but the largest models, so the choice is between VHS-C and 8MM. Even then only the smallest and lightest models are really suited... much over three pounds, including battery and tape, is too heavy for most boats. I use a Sony 8MM, as it allows more on a tape, but the VHS-C does have the advantage of being played in home VCRs via an adapter. Whichever format you use, it might be wise to avoid those with infrared auto-focus. It will have to be protected from water by some sort of cover or bag, which will interfere with some IR auto focus systems.

CHOOSING A BOAT

A lot will depend on the camera you plan to use, but in general, the larger the boat, the more suited it is. A 36/600 class boat should be able to handle a compact 35mm still camera or a very light Super 8 film camera... anything up to a couple of pounds including the mount. For anything heavier, such as a video camcorder, you'll need a larger and more stable boat such as one of the older Marbleheads with the deep, heavy bulb-keel. The new super-light Ms probably won't handle the strain... stick with an older design meant to carry

Glare from sun slightly marred this shot. A lens shade would help. It's not always easy to know your exact heading when seen from shore.





extra weight with ease. I used a more or less stock "Spot," rebuilt as a 10-Rater carrying much more sail area. With the 8MM camcorder aboard, it weighs a bit over 16 pounds... heavy but not too bad if the wind is decent. Other large boats such as the "A," "J," or Santa Barbara would also be good choices. Boats such as the EC-12s, which don't have the deep fin and bulb keels, would probably not be stable enough except in light winds.

Though this article is about model sailboats, there is no reason you couldn't mount a camera on powered models as well. Large, stable electric powered vessels should work OK, but I would avoid gas engine powered models. The vibration and exhaust residue would be likely to damage the camera or at least spoil the photographs. It has not been tried yet, but a medium-sized sailboat with the mast, sails and rigging removed might make an excellent camera vehicle. (It might be just the thing for getting the R/C Warship action on tape.) Mount the camera amidships and install an electric motor for propulsion. You would lose the "heeled-over" angle shots of the sailboat, but would gain in stability and have the option of forward and reverse motion. A Star 45 looks like a good choice... it is compact, beamy, and has a relatively shallow draft. A Soling would probably work well too.

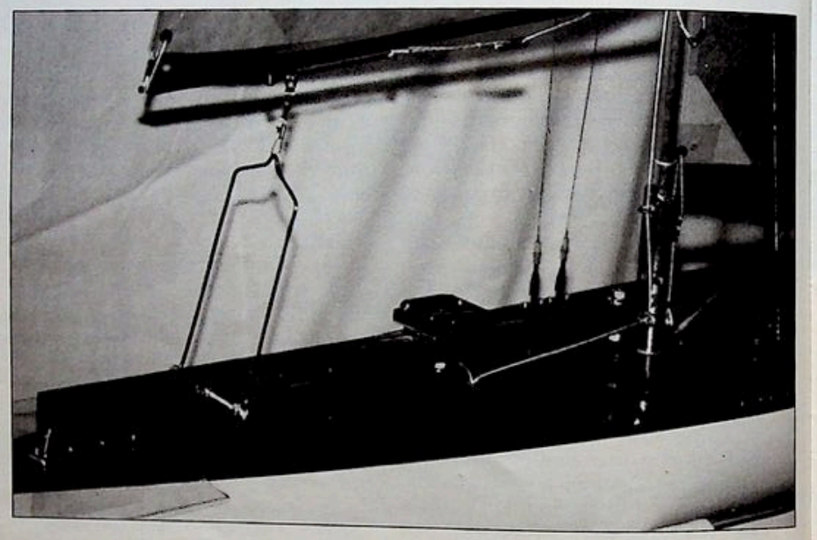
BOAT CHANGES

Unless you just want to mount a small still camera on the bow of one of the larger boats, some changes will have to be made to the jib and/or its attachment fittings. The jib club must be high enough off the deck to clear the camera body and the swivel attachment point must not be in front of the lens. On some boats it may be possible to move the jib from its attachment point to a position all the way up to the top of the mast. This may violate class rules, but it is much easier than changing the sail.

If the jib can't be raised, it will have to be shortened or replaced with a smaller sail. Use one from another boat or make a new one, but don't try to sail just on the main. A small jib is much better than none at all. (If you have never made your own sails, don't be afraid to give it a try. See the Winter 1988 issue of this magazine for complete directions.) The jib swivel attachment to the deck will also have to be raised. An inverted "U" bracket made from a coat hanger and bolted to the camera mount is the easiest I have found. Note the off-center position to clear the camcorder lens. (See photographs.)

Don't forget that when you change the jib you will also have to change the jib sheet as well. The best way is to run the line back from the fairlead and up the mast so it will not foul on the camera or mount. Small brass bands with split rings soldered on as shown in the photographs work nicely.

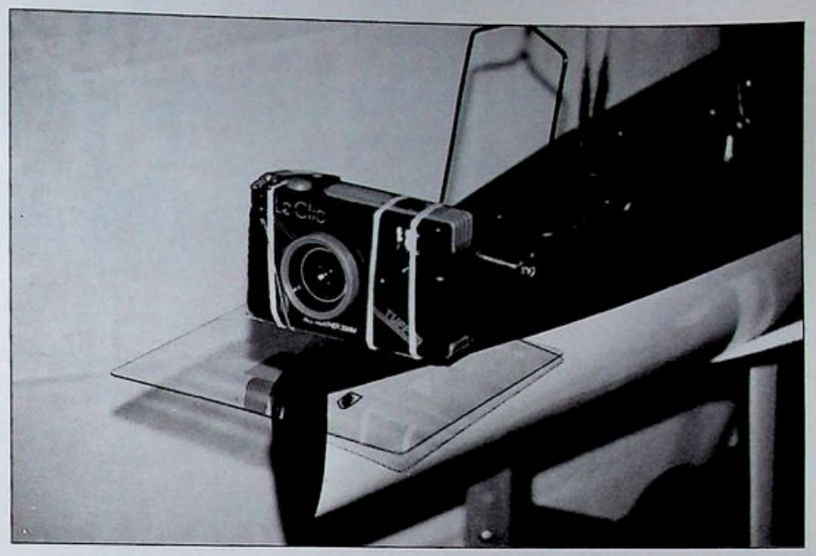
With all that weight in front of the mast, the bow is going to ride low, so the radio and winch battery packs should be moved as far aft as possible to try to compensate. Velcro will hold them in place. Mine were moved to just forward of the rudder post and I still had to add several ounces of lead next to the transom to get things in reasonable trim. The larger the boat, the less of a problem this will be.



MOUNTING THE CAMERA

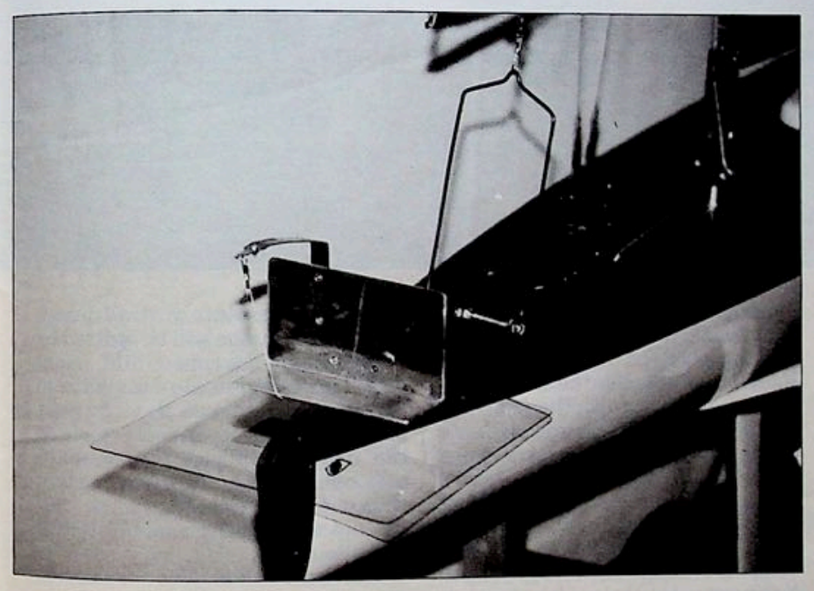
Again, a lot will depend on the boat and camera you plan to use. Small still cameras may be attached to a bracket which is in turn bolted to the jib rack. Double-sided foam tape holding a plastic or aluminum tray is also a possibility, with the camera held in by rubber bands. It is desirable to be able to vary the camera angle via the mount, but not essential. Shims under the camera can also be used.

Heavier cameras will have to be mounted just forward of the mast in order to keep the bow from riding low. The most practical way is to mount the camera on a wood or aluminum beam attached to the mast and the jib rack. This beam is all that holds the camera on when the boat heels over, so it must be strong but not add too much excess weight. Wood beams should be sanded smooth and given a coat or two of varnish to seal against the water. The beam attaches to a metal bracket that is clamped around the mast. This bracket can be raised and lowered on the mast to adjust the camera angle. The camera is attached to the beam with what is known as a "Quick-Shoe"... a device that installs between the camera and tripod to allow its release without having to remove the tripod mounting screw. The Quick-Shoe is sold in most good camera stores and is well worth its cost... mounting the camera would be much harder without it.



WATERPROOFING

Unless you are using an underwater camera, this is absolutely necessary. Even if the camera is expendable, a good soaking with lake water is likely to damage the film.



There are several ways to protect the camera. The safest would be a commercial underwater housing... either a plastic box with seals or a heavy plastic bag with a secure closure. Both are available for many different cameras and camcorders, but they are quite expensive. A reasonable alternative for video use is a "rain shield," which keeps out the spray but is not totally watertight. I found one at a camera store for under $20, though I had to add a clear filter to cover the lens opening and do some reworking to make it fit my particular machine. It should also be possible to make an enclosure using heavy plastic bags taped to the end of a plastic jug. Cut a hole in the end of the jug and epoxy in a clear glass filter for the lens to look out. Even better is to use an "adapter-ring" so that a variety of threaded filters can be fitted for different effects. Make sure the filter size is large enough to clear the widest angle lens you plan to use. If your camcorder has a removable viewfinder or eyepiece, take it off. They just get in the way, and the ones with tiny TV screens waste some battery capacity.

Whatever enclosure you use, it will interfere with the camcorder's built in microphone. If sound is important to you, mount a jack on the enclosure and wire it to plug into the auxiliary microphone input on the recorder. Then get a small, inexpensive microphone to mount outside the enclosure and plug into the new jack. It wouldn't hurt to put a foam wind screen on the microphone and seal it against water.

Small still cameras can be inserted inside a Ziplock food bag. The one I used happened to be a water-resistant model, so I just cut a hole in the bag for the lens to poke through. Regular models will need a clear plastic or glass window over the lens. Just make sure it is watertight if the camera is mounted close to the bow where there is more spray.

You may want to add some sort of spray shield to the bow to deflect as much of the water as possible. A plastic sheet held on with double sided tape does a reasonably good job.

CAMERA OPERATION

Video camcorders can be left to run until the tape or battery runs out, though with the VHS-C format limited to 20 minutes per tape, it might be worthwhile to rig up a remote pause control. The shutter on a still camera must be fired for each frame.

In either case, you will need a separate radio channel for the camera. You can install an extra servo, or do as I did and disconnect the jib trim servo and use it to pull on a line exiting through the jib fairlead. This line runs forward under the still camera and up to a lever above the shutter release. When the line is pulled in, the lever arm comes down and fires the camera, then the line is released, the lever returns to normal, and the camera recycles for the next exposure. A movie camera may be triggered in a similar manner, except that the line may have to pass behind the mast and back around to get the angles right. It might be a

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good idea to have a rubber band or spring somewhere in the line to make sure the servo doesn't jam due to excess travel.

Once you have the camera mounted and ready to go, you'll need to aim it at the proper angle to the surface of the water. Since the camera will be only a few inches above the water, it must be aimed several degrees above horizontal. The bow will probably ride low due to the extra weight, so add several more degrees of positive camera angle. There is no easy way to get it just right the first time... you'll have to "eyeball" it. Once you see how the boat looks in the water, you can change the angle until it looks right. You won't know for sure though, until you see the results of the first tape or roll of film. Then you can change things as needed... it isn't that critical anyway. With a normal or slightly wide angle lens, if you are anywhere close to the proper angle, the initial results should be reasonably good.

OPERATION ON THE WATER

It is suggested that the first trials be done in light winds, until you get used to how the boat handles with the extra weight and sail changes. It might be prudent to sail at first with a dummy load on board instead of a camcorder, just in case. The small still cameras won't change the boat's handling much, but the weight of a camcorder sure will. The boat will take longer to accelerate and slow down, and will tend to plow going downwind. Tacking and rounding marks will tend to be sluggish as well. It isn't all that bad, but you will find that your boat will no longer be competitive in its class, especially in light air. As the winds become stronger, the gap will diminish but not go away. In a way, that is to your advantage. You can only photograph boats in front of you, so the more you fall to the back of the pack, the more chances you will have for catching other boats in action.

In any case, plan on going through quite a bit of film or tape to get a few good shots. Light wind is OK for test runs, but the exciting moments happen only when there is enough wind so the boat heels nicely and builds up some speed. Video footage of boats drifting along is boring, but a good clip with the boats heeled over and the spray flying is enough to get the old adrenalin flowing for sure. I would advise against trying to sail in really high winds or waves unless your camera is absolutely waterproof. Even then the lens will be spotted by spray most of the time.

Still photographs also benefit from a bit of action, though the relatively slow shutter speeds in some cameras can make it difficult to get sharp action shots. If your camera has more than one shutter speed, use the fastest one the lighting and film speed will allow.

With both still and video cameras, you will need to keep your boat fairly close to the others to get images large enough to fill the frame. With the slightly wide angle lenses, try to keep within at least 15-20 feet of your "quarry"... even less if possible. The more boats in the frame, the farther back you can get, but not too far. Try different distances, as well as shots from the front, sides and rear. If you get several good shots or clips in an afternoon, you're doing OK. Most of what you shoot will be junk, but those few good shots make it all worthwhile.

Clear, sunny days will give you the best results. If you are using a film camera, a polarizing filter will make the colors appear richer and more intense, as well as reducing glare off the water. Keep in mind, though, that it will cut down on the light some and is not very effective on video. Mid-afternoon is usually the best time for good photographs. The light takes on a warm, almost golden quality and the images seem to glow. Mid-morning light is also good, but in both cases, you have to remember that shooting into the sun will give a very different effect than away from it. Even if your camera has a back lighting setting, you are not out there to make the adjustment. Back lit subjects can make excellent photographs, but aiming directly into the sun is a definite no-no, especially with a video camera. Keep that in mind as you sail around the course... in a race, there is sure to be at least one leg sailed into the sun.

Another thing to remember is to keep your camera lens and filters clean. Dust or drops of water can spoil an otherwise great shot. Carry some lens tissue and cleaner with you and clean up every time you take the boat out of the water. If there is a lot of spray flying, clean it more often. Lake water is usually quite dirty and leaves stains when it dries. (I won't even mention salt water... you're asking for disaster just by putting a camera out in it!)

On entering your rig in a regatta, I know of no specific rule against it. An informal regatta or club race should pose no real problems, especially if you are a regular participant, but it would be a good idea to ask around to see if anyone had reservations about being photographed. Some folks are a bit shy or don't care to have their lake-side comments recorded for posterity (or hilarity!). Major sanctioned regattas are another matter... participants are usually serious about racing and may not want any distractions. Check with the Regatta director and the other skippers first. If you are otherwise legal, and don't cause any disruptions with the cameras, chances are things will be OK. It still would be wise to film or tape just a few heats and sail the others without the camera, or drop out and shoot from shore. If you make a nuisance of yourself, you won't be welcome back.

OTHER POSSIBILITIES

I have seen ads, in both model and video magazines, for lightweight, low cost video transmitters. Combine one with a tiny video camera and mount them onboard in place of the camcorder and beam the signal to a TV on shore. Imagine watching live remote video from your boat... just like the coverage of the America's Cup races! With a portable VCR you could capture the whole thing on tape, or maybe even try to sail just by watching a TV screen.

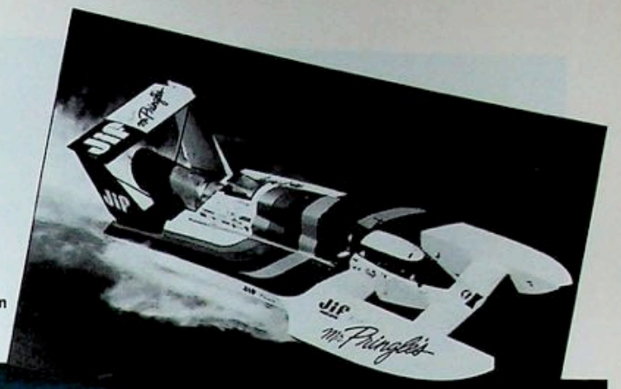
Once you get enough good video or film footage, edit it down into a half hour or so of highlights, perhaps interspersed with shore footage and maybe some narration. A good video makes an excellent program for a club meeting or for use at a shopping mall model display. I doubt if there is much commercial use for this sort of thing, but you never know. On-board photography isn't an end unto itself, but as an interesting addition to the usual camera viewpoint. Use it but don't overuse it.

I hope this article will spur some of you to give this a try. I have enjoyed both model boating and photography for many years and this has been one of the more satisfying projects. If anyone out there tries this, I would be very interested in seeing the results, especially the part about the video transmitter. Send comments, questions, tapes, etc., to me at 1227 Littlebrook Lane, Birmingham, Alabama, 35235. I look forward to hearing from you. Good luck. •

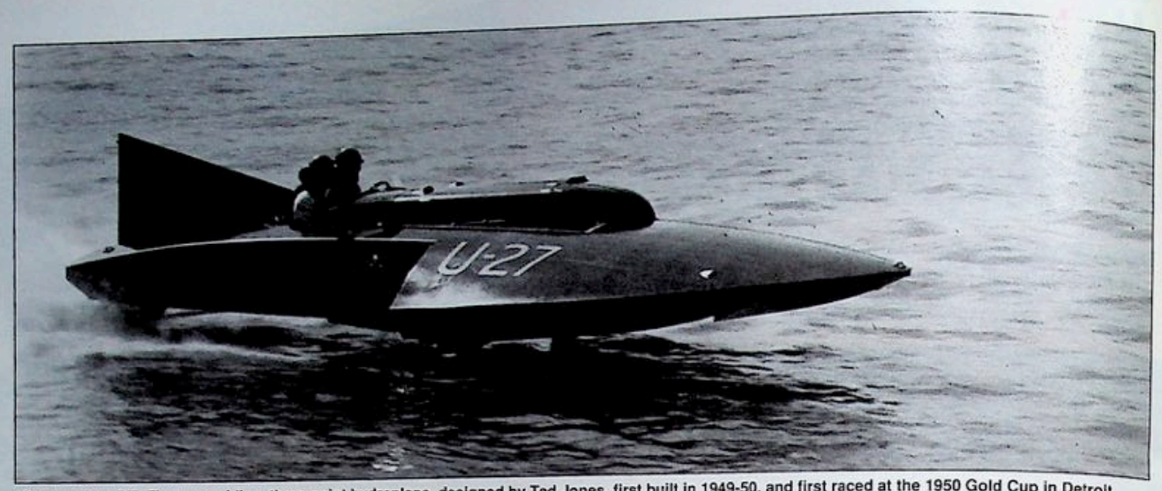
BY JOHN S. GILL

HISTORY OF GOLD CUP UNLIMITED BOAT RACING

In 1903 the American Power Boat Association (A.P.B.A.) was organized to "promote the racing and use of power boats, the improvement of their design and construction, to formulate rules, to govern trials of speed, endurance and competition between such boats and to further the interest of its membership consistent with the needs and aspirations of the people of the United States of America." This article of the A.P.B.A. rules was not adopted until 1912, but as you can see, the promo-



(Right) "Mr. Pringle's" (Below) "Miss CIRCUS CIRCUS" Photos by Jim Vota, Official APBA Photographer.



"Slo-mo-shun IV" First prop riding, three-point hydroplane, designed by Ted Jones, first built in 1949-50, and first raced at the 1950 Gold Cup in Detroit. First three events, it set world one-mile speed record, won Gold Cup, and the Harmsworth Trophy. Photos by Jim Higgins, courtesy of APBA.

tion of boat racing is of the prime importance.

In 1904 a few well-to-do New Yorkers of the Manhattan's Columbia Yacht Club commissioned Tiffany & Company to make a trophy for a Challenge Cup race. The boats being run at the time were for the most part runabouts and ran speeds under 20 mph. This race soon became known as the Gold Cup Challenge, the top award in boat racing and administered by a new boating organization known as the A.P.B.A.

Since those days boats have developed a long way. Those famous names such as Christopher Smith (Chris Craft), who developed the power boat in the early 1870s several years before the automobile was invented, and Mr. Leighton, who won the Gold Cup in 1905 with a Boat Named "Chip" and again in 1906 and 1907 with "Chip II." Then there was Clinton Crane, a boat designer ahead of his time, building "Dixie," the winner for 1908, 1909, 1910 and setting a speed record of 45 mph. And John Ryan who, in 1911, asked Smith to build a boat that would break the world speed record; this combined effort resulted in the first hydroplane. A far cry from what we have today, this was a single step about midships in what was basically a runabout hull, but this boat could run at over 60 mph.

One of the most famous names in boat racing history soon appeared, Garfield A. Wood. Gar Wood was instrumental in bringing speed to the boating world, with his innovative ideas. The single most important was to combine aircraft engines and hydroplane hulls.

In 1915 the Gold Cup race was moved to Detroit, Michigan, and in 1917 Gar Wood and Christopher Smith brought us great boats such as the "Miss Detroit" and "Miss America" hydroplanes. At this time other greats were running, such as Caleb Bragg, with the "Packard Criscraft" and "Baby Bootlegger," taking three consecutive wins; George Townsend with "Greenwich Folly," and Vic Kliesrath in "Hotsy Totsy," each having two wins. Then "El Legarto," driven by George Reis, won from 1933 to 1935.

These races were already drawing crowds of ower 600,000 and the names involved looked like a who's who—names like Henry Ford, Edsel Ford, Walter Chrysler, Horace Dodge, and the Fisher Body brothers.

In the late '30s the races took on an international flair when J. Lee Barrett went to Italy and brought Theo Rossi di Montelera to the 1937 Gold Cup. Rossi, the head of Italy's vermouth industry, returned in 1938 and won the Gold Cup race. His plans for 1939 were cut short by WWII. Because of the war, racing was suspended from 1942 to 1945. After the war, racing resumed and the Unlimited power boat class soon became known as "Thunder Boats." Using war surplus Allison and Rolls-Royce Merlin aircraft engines, once again the Detroit River came alive with the thunder of these mighty boats.

In 1946 the famous band leader, Guy Lombardo, took the win driving "Tempo VI," followed by Danny Foster in the "Miss Pepsi" in '47, and "My Sweetie," driven by Bill Cantrell, in 1949.

The '50s brought a major change when a boat with a very unassuming name came on the scene. "Slo-mo-shun IV" from Seattle, Washington combined aerodynamics with hydrodynamics. This boat so dominated the Gold Cup race that with her sister boat ("Slo-mo-shun V") they took the victories from 1950 to 1955. "Slo-mo-shun V" also brought a new problem to hydroplane racing: keeping the boat on the water, it being the first boat to blow-over.

These boats also moved the capital of Unlimited hydroplane racing from Detroit to Seattle. The Unlimited capital moved but the A.P.B.A. headquarters did not, remaining in Detroit where it is today.

In 1955 a new driver started working his way up, a name we would all become familiar with: Bill Muncy, the most successful driver in boat racing history, with 63 victories, seven national, and eight Gold Cup wins.

This brings us to the present, where boat racing has reached a fine degree of art and technology. From the Thunder Boats like the "Miss Budweiser," to the offshore super boats like the "Popeyes" and down through the classes to the J-boats and jet skis.

All this racing was and still is under the watchful eye of the American Power Boat Association. There are ten divisions in the A.P.B.A.: Unlimited, Offshore, Professional Outboard, Modified Outboard, Stock Outboard, Inboard, Inboard Endurance, Outboard Performance Craft, Drag, and now, as of 1988, the A.P.B.A. has picked up the model R/C boats so that we modelers can run with the same organization and guidance as the full-size boats. This includes running internationally through the A.P.B.A.'s ties with the U.I.M. (Union of International Motorboating) and C.B.F. (Canadian Boating Federation).

Orchestra leader Guy Lombardo at the helm of his "Tempo VI," formerly "My Sin." Won two Gold Cups as "My Sin" before World War II, and won the 1946 Gold Cup as "Tempo VI." Designed and built by Adolf Apel, of Ventnor Boat Company.

Each country has one power boat organization designated as the "National Authority" by the U.I.M. The A.P.B.A. is that authority in the U.S. so only records set at A.P.B.A. sanctioned regattas will be approved as world records.

The A.P.B.A. sanctions events, making sure that the race participants meet certain requirements, to insure a safe and fair race. This might include supplying referees, checking the course, and making sure that all the racing rules are followed, thus making the event safe and enjoyable for all participants, and fans.

In the constitution and bylaws of the A.P.B.A. R/C Commission, the article that stands out is the Objective & Dedication. "The objective of the R/C MODEL RACING COMMISSION shall be the fostering of radio-controlled Model Power Boat building and racing; and the coordination of member Clubs and Racing Teams, to that end that there shall be uniform rules and classes of boats throughout the United States and Canada. The R/C MODEL RACING COMMISSION shall be a nonprofit organization, dedicated to the progress and promotion of the hobby of Radio Control Model Power Boating through fellowship, sportsmanship, and competition; and shall also be dedicated to the aid and development of youth and youth activities."

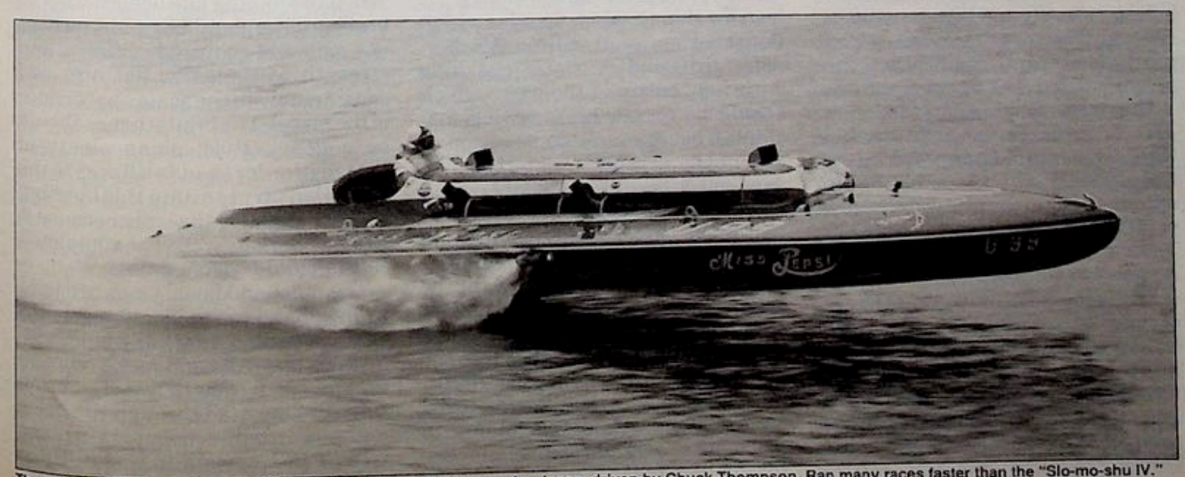
Safety in racing is of the utmost importance and the A.P.B.A. is no slouch in this area. The rules specify courses, pits, boat safety equipment, and passing procedures. Even with the models, safety procedures are specified.

These rules must be adhered to so that boat racing can be safe and fun for all, and if you don't like the rules the membership can vote to change them. This means that the organization does not tell the membership what to do, but rather that the membership tells the organization, as everyone has an equal vote.

Running over 400 full-size and as many model events, the A.P.B.A. has become the voice of the boater whether full-size or model.

As for myself, I have been running model boats for more than 35 years. For the past 27 years I have only run scale and fast electric. I have designed and built boats that run from sic to 30 cells with speeds over 40 mph. Now serving as National Electric Competition Chairman for the A.P.B.A., I hope that we can bring the model boating community together and have fun and continue this fine and long history.

For more information on the A.P.B.A. and the R/C Model Racing Commission, write to the Amercian Power Boat Association, 17640 East Nine Mile Road, East Detroit, MI 48021-0377, or R/C Model Racing Commission, American Power Boat Asscoation, 5001 Stormy Ct., Bakersfield, CA 93309. •



The Hacker-designed "Miss Pepsi." Last of the successful step hydroplanes, driven by Chuck Thompson. Ran many races faster than the "Slo-mo-shu IV."

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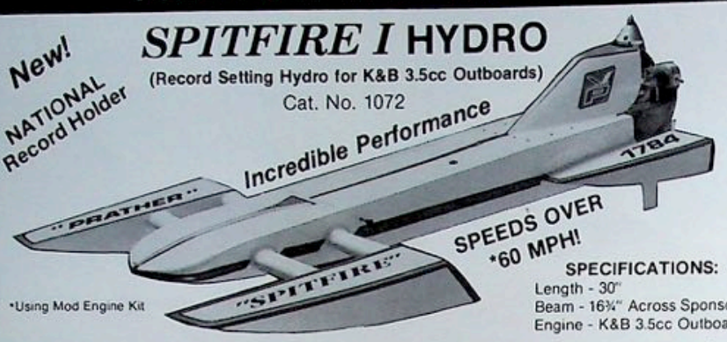

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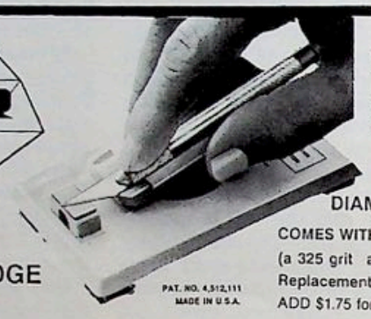

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MARA *Continued from page 39*

sition acceptable, cement the masts in place by applying plenty of cement to the step at the bottom and slip the mast through the deck hole into the hole in the plywood mast support. Now apply cement to the mast/deck junction. Several applications are recommended. Let dry overnight.

The mast stays are added now. Attach the large vangs to the bulwark with round head wood screws and cement. It is advisable to also apply cement to the protruding screw points on the inside of the bulwark. The stays are cut from heavy black carpet thread. They can be tied securely to the mast and bulwark vangs, or tied to small hooks bent from straight pins. The hooks are slipped into the vang holes. This permits the removal of the stays at any time. The stays are a scale item and not necessary for the operation of our ketch. Dummy navigation lights can be made from scrap wood or plastic and cemented to the stays as an added scale feature.

SAILS

The sails are cut oversized as shown, from close-woven cloth a bit heavier than a man's handkerchief. Bedsheet material will do. Mother, wife, girlfriend or sister can help with the sewing of the sails, which should be done with a sewing machine. The material can be cotton or any of the synthetic materials. We used cotton because the slight nap on the threads closed the spaces between the threads, thereby making the sail more efficient. A folding or hem is required on every side of the sails. This should be about the size shown on the sail plan and is a rolled hem as the detail illustrates. Iron the material free of wrinkles before cutting, and be sure to allow material for the hems. Hold the folding in place with straight pins, and use thread of the same material as the sails, i.e., cotton thread for cotton sails and synthetic thread for synthetic sails. The folding should overlap at the corners of the sails in order to add extra strength at these points. When the folding has been sewn, the brail stitches should be added. These not only add required stiffness and strength to the sails, but also add considerably to the scale appearance of the model. The brail stitches should be a heavy style, using plenty of thread in order to add stiffness to the sails. Don't try to attain this by using heavier cloth for the sails because it will not work as well. The completed sails should be ironed flat.

The mast and boom rings are bent to shape and cut to length as shown on the sail plan. Mark the ring locations on the sails and make holes in the sails with a sharp awl. The boom rings are inserted through the holes in the sails, while the mast rings are sprung just enough to install them on the masts. Slip the boom into

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on the masts. Slip the boom into the rings and then carefully slip the mast rings through the holes in the sails.

Blocks are attached to the vangs with short lengths of fine soft wire. Form a loop through the block shackle and the vang hole and twist the two ends of the wire together. Cut off all but 1/8 inch of the twisted portion.

Sail installation starts by tying the corners or clews of the sails to the booms and gaff by looping a short length of 20 lb. line through holes in the sail and the hole in the booms and gaff. Holes in the sail for the lines can be made with an awl. Knot securely, snip away the excess line and seal the knot with a bit of cement.

Sew the mainsail to the gaff using cotton thread. Measure and cut oversize the halyards "A," "B," and "C" that raise and lower the sails. Add 20 inches plus to the measured length to allow for the added line required when the sails are lowered and the line must then lead from the cleat up through the block and down again to the sail. Tie one end of the lines to the top of the foresail and mizzen and to two locations on the gaff. Pass the lines through their respective blocks and down to the cleats. Raise the sails and secure lines to the cleats. The lines serving the mainsail gaff should be adjusted by pulling and slacking until the gaff forms the proper angle to hold the mainsail without wrinkles. Then, knot the lines together where shown on the sail plan and cut away the excess of one line. The remaining line is secured to the cleat. Adjust as required.

Sheet lines are 20 lb. fish line, and are firmly tied to the booms through the holes in the location shown on the sail plan. Pass the lines through the copper tubing guides to the control arm of the Probar sail control unit. With the control arm in the athwartship position (across the hull from side-to-side) the booms should form a 30 degree angle measured to the centerline of the hull. In this way, moving the Probar arm to a fore and aft position in one direction will lay out the sheets and increase the angle, while moving the arm to the opposite fore and aft position will haul in the sheets for a close hauled rig. Tie the lines securely to the correct side of the Probar arm.

Sailing should not be attempted before all equipment is checked out and found to be in working order. Before the initial run, place the completed model in a bathtub or some other still body of water, and check to see if the water level meets the waterline painted on the model. Depending on the weight of the equipment installed, it may be necessary to install additional lead ballast to the hull interior at the very bottom on each side of the keel. We installed the lead weights that are used to balance automobile wheels. These can be found on the floor of most tire installation shops. Place the weights in the hull, replace the cabin, and check the waterline. Shift, add, or remove weights as necessary, and when the craft floats properly, apply cement around the weights with a long strip of balsa. Needless to say, a day with moderate breezes affords the best sailing pleasure, although 'Mara" can operate in any weather from the lightest breeze to fairly heavy spring winds.

Begin operation with the Probar arm in the athwartship position and sails at the 30-degree angle. The novice should familiarize himself with the sailing chart on the plans, which will provide some basic sailing information regarding sail and rudder angles for various wind directions. It will be found that most of the

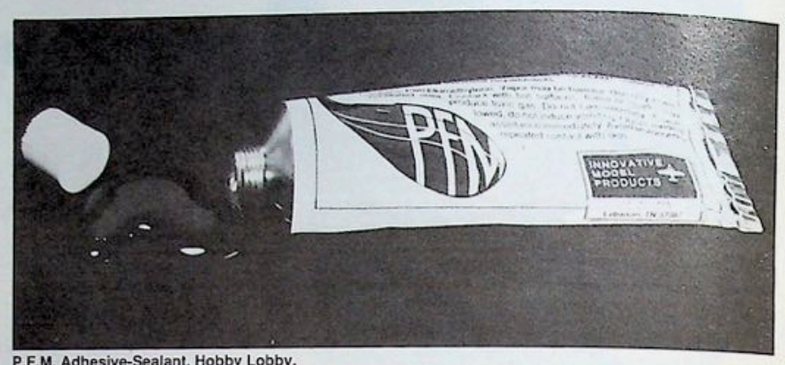
continued on page 56

SHIPS STORE

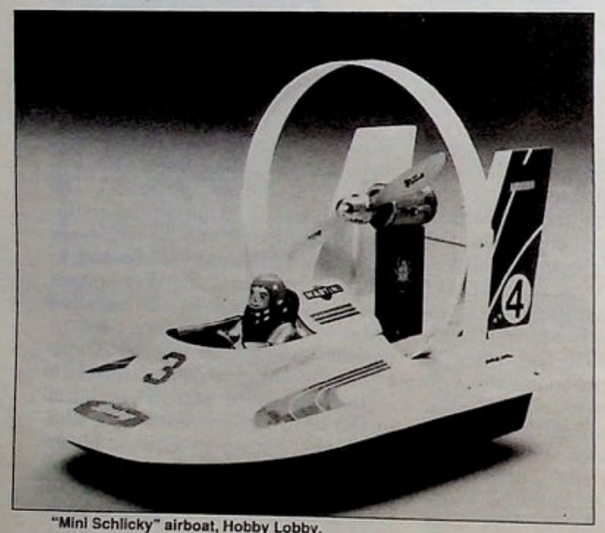
Itech Marketing, P.O. Box 391, Edison, NJ 08818-0391, phone (201) 248-8738, has introduced two new Enya engines for marine use, the SS30 and SS50 Ring Marine engines. Based on the highly successful SS30 and 50 helicopter engines, the marine versions are Schnuerle-ported, with aluminum alloy pistons and steel rings, running in hardened steel cylinders. Each one comes with a G-series carburetor, and also a muffler for quieter running. A tuned muffler assembly is also available for each engine, for those looking for more performance. The crankshafts come with 1/4 - 28 threading to fit the flywheels and adapter nuts of your choice. Check 'em out at your dealer.

• • •

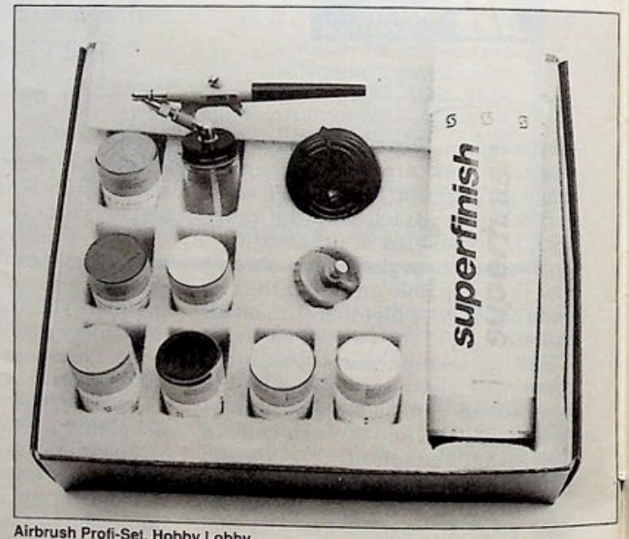
Hobby Lobby International, 5614 Franklin Pike Circle, Brentwood, TN 37027, phone (615) 373-1444, has completed its new catalog, Number 16, which will be available as you read this. It is free of charge in the US, or two dollars outside of the US. Always full of intriguing hobby items that you're not apt to find in your local hobby shop, it's something no modeler should be without. Here are some new products found in the latest edition that should interest model boaters:



P.F.M. Adhesive-Sealant, Hobby Lobby.



"Mini Schlicky" airboat, Hobby Lobby.

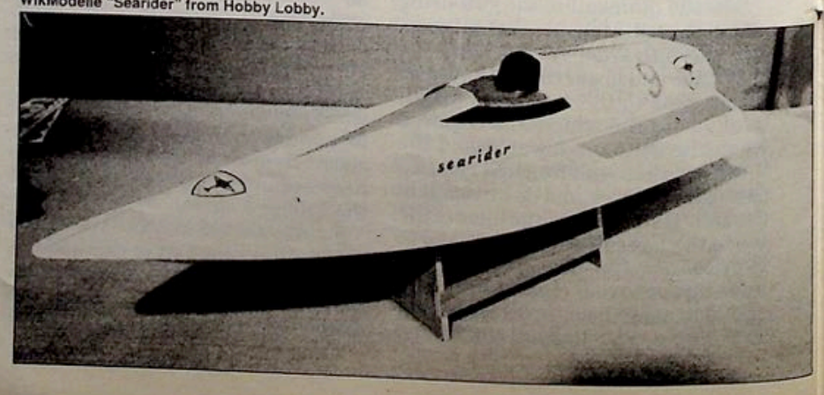


Airbrush Profi-Set, Hobby Lobby.

This one sort of closes the gap between airplane and boat modelers. It's the Simprop (from Germany) "Mini Schlicky" Airboat, for electric power. For running on water, ice, snow, wet grass, or any slippery surface, this ABS catamaran hull airboat was designed for high speeds under electric power. It's 19-1/2 inches long, 11 inches wide, 12-1/2 inches high, and uses a 2-channel surface radio (throttle and rudder). You supply the electric motor, 7 x 4 prop, and 7-cell battery.

Also from Simprop, through Hobby Lobby, the Airbrush Profi-Set is a professional airbrush set with paints, and no clean-up after use! The set includes seven paints, propellant, and spare tire adapter (for alternate use). Each paint color bottle screws onto the spray gun. When you're finished using the color, unscrew the bottle, cap it, run some thinner through the spray gun, and the clean-up's done!

WikModelle "Searider" from Hobby Lobby.



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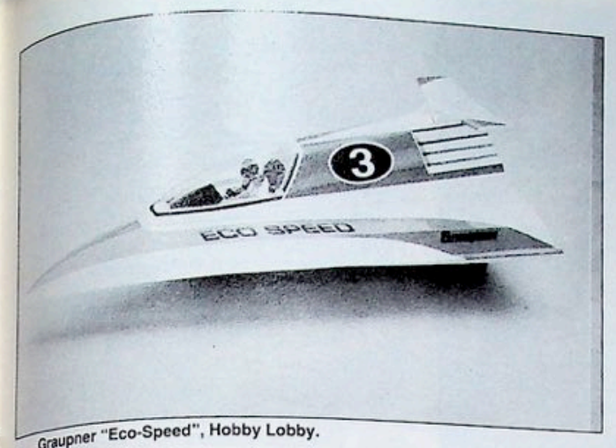
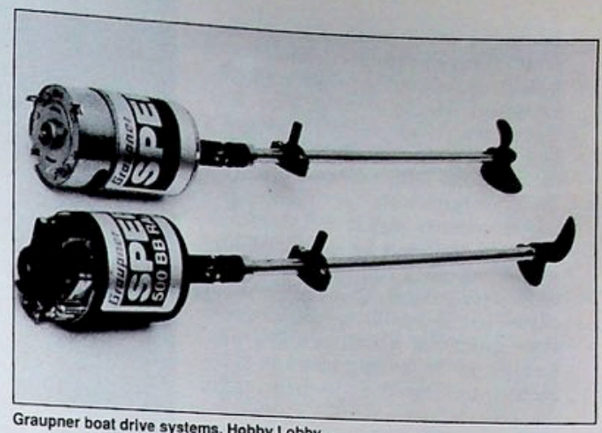
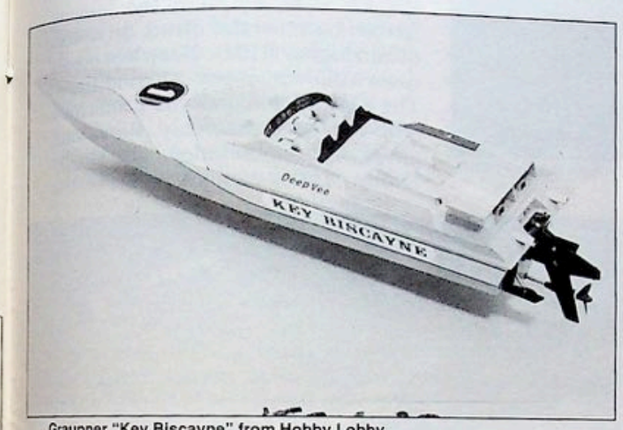


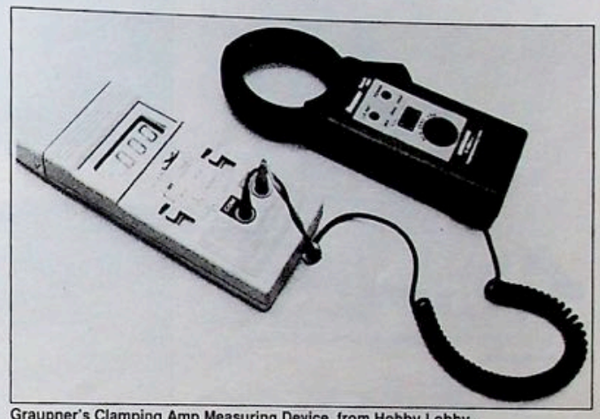
Graupner "Eco-Speed", Hobby Lobby.



Graupner boat drive systems, Hobby Lobby.



Graupner "Key Biscayne" from Hobby Lobby.


Graupner's Clamping Amp Measuring Device, from Hobby Lobby.

Imagine a glue like silicone rubber that dries in 30 minutes and glues anything to anything. Hobby Lobby has such an item, and it's called "P.F.M." Adhesive-Sealant. It will permanently patch holes in plastic fuel tanks, glue servo rails to fiberglass fuselages, form waterproof and fuelproof seals, glue canopies, etc. Only one no-no... it melts foam... get your "UFO" for that job!

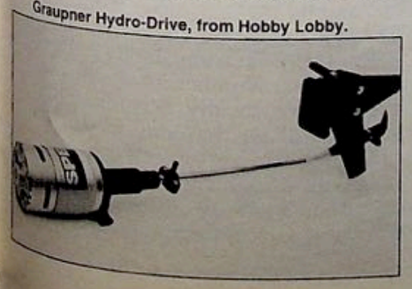
From the "tube" to the "tub" (only it better be a real looonnng tub!), Hobby Lobby has the WikModelle "Searider." Designed to accommodate the GT 500 electric motor from Hobby Lobby, this 34-inch long, 12-inch beamed, ABS mono-hulled boat should be awesome. Their ROA500 speed control is recommended. Hmmm... better make that a looonnng lake!

Hobby Lobby's latest Catalog #16.

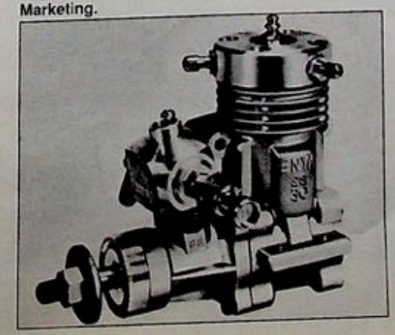
There's more...

Now this sounds like the perfect R/C electric boat for any "numb-thumbed" racer. It's the Graupner/Hobby Lobby "Eco-Speed" Electric Race Boat. Not only is it very fast, but after the inevitable flip-over from

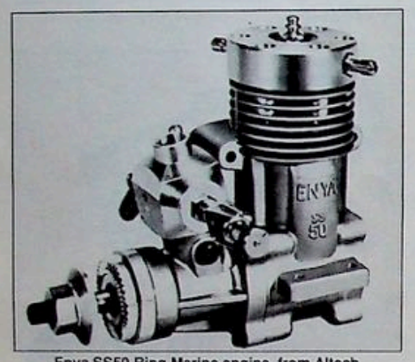
Graupner Hydro-Drive, from Hobby Lobby.



Enya SS30 Ring Marine engine, from Altech Marketing.

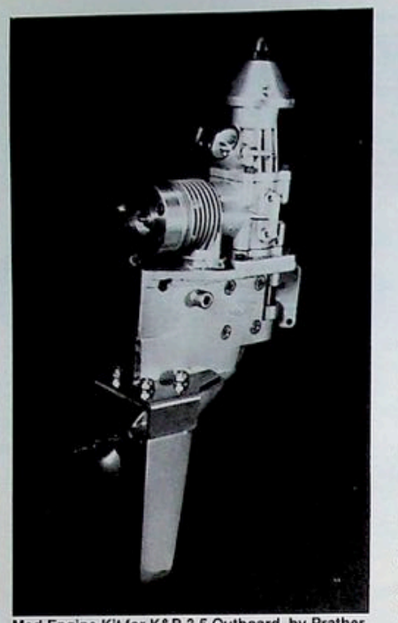


bouncing off a marker or another boat (Heaven forbid!) in the heat of battle, it will roll upright and continue on its merry way! The Eco-Speed was developed by H. Lehner, a boat racing champion in Europe. The twin-tunnel ABS hull was designed for minimum water resistance, giving maximum speed and duration. It's also designed for quick building as well as quick running, and comes with a pink decal. Three other decal colors are available so you can sort them out if more than one is in a race. Length is 21 inches, beam is 8-1/2 inches, and the ready-to-race weight is 42 ounces. Uses any 2-channel surface radio.



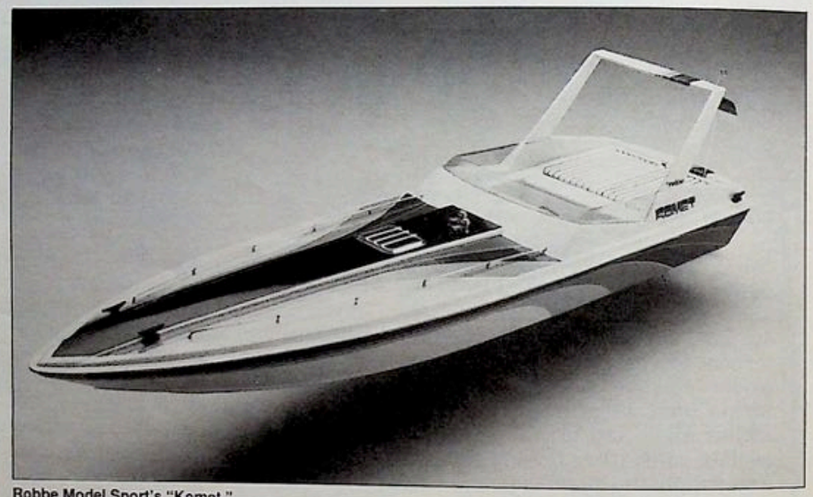
Enya SS50 Ring Marine engine, from Altech Marketing.

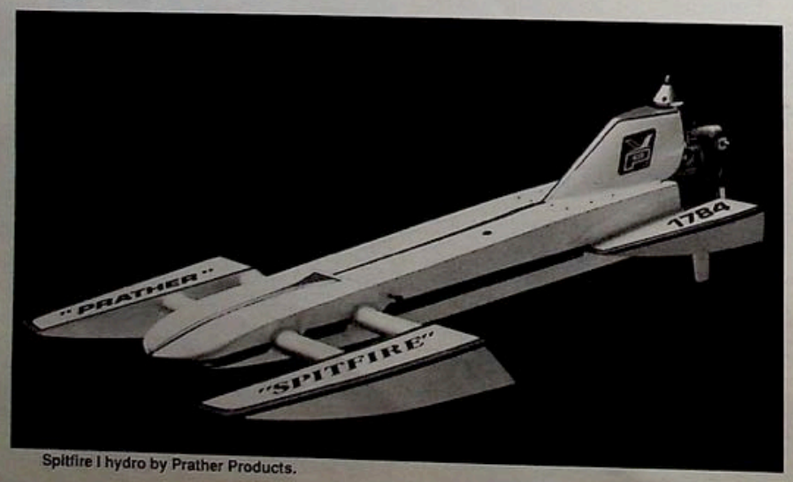
Battery-powered tools from International Hobbies Corp.


Mod Engine Kit for K&B 3.5 Outboard, by Prather Products.

Just so happens that Hobby Lobby also carries the Graupner Multispeed 500 Race VS Boat Drive and the Multispeed 600, 8.4-volt Boat Drive direct drive systems for the Eco-Speed. These systems include motor, U-joint, shaft, lubrication fitting, and prop.

For something a little heftier and faster in electric boats, Graupner/Hobby Lobby (See, Larry?) offers the "Key Biscayne," which is a direct-drive version of the "Arrow." It is 34 inches long, has only an 8-1/4 inch beam, and weighs 74 ounces with 12 cells. Even the standard version of the KB is faster than the famous Arrow, because the direct drive can attain higher RPMs. Deep Vee ocean racer hulls run in any sea conditions. The KB hull and deck are preformed ABS for quick assembly. Black and silver decal is included. The Hobby Lobby catalog helps you make the proper selection of motor, flex cable, stern tube and bracket, outdrive unit, coupler, and prop.


Robbe Model Sport's "Komet."



Spitfire I hydro by Prather Products.

Bet you knew this was next. If you want to blow every boat off the pond with your Key Biscayne or Arrow, Hobby Lobby just happens to have the Graupner Hydro-Drive Flex 700 Turbo Direct Drive System for these boats. It has everything mentioned above, and there is also an optional ball-bearing set for the outdrive.

The last item from Hobby Lobby's new catalog Number 16 for this report (we've hardly scratched the surface) will also be mentioned in the new products section of our other magazines, as anyone into electric propulsion will be interested. It's another Graupner product, the

Unlimited hydro from Robbe Model Sport.

Clamping Amp Measuring Device, which measures current up to 400 amps without disconnecting wires! We've seen similar tools being used by electrical technicians, but this one is for the modelers. Squeeze the clamp open on this tool and let it close around one of the wires to the motor or battery, wherever you want to measure the current flow. Plug the CAMD into your digital multimeter which can display voltage in increments of .001 volts. Each amp of current flow will register as .001 volt. Example: a current of 34 amps will read .034 volts. The CAMD uses a 9-volt battery, and accuracy is plus or minus two/tenths of a percent.

• • •

International Hobbies Corporation, 350 E. Tioga St., Philadelphia, PA 19134, phone (215) 426-2873, FAX 634-2122, offers four battery-powered tools from the Totex line that would be real handy for the traveling hobbyist, for field repairs, and even for small jobs at home whether or not AC is available nearby.

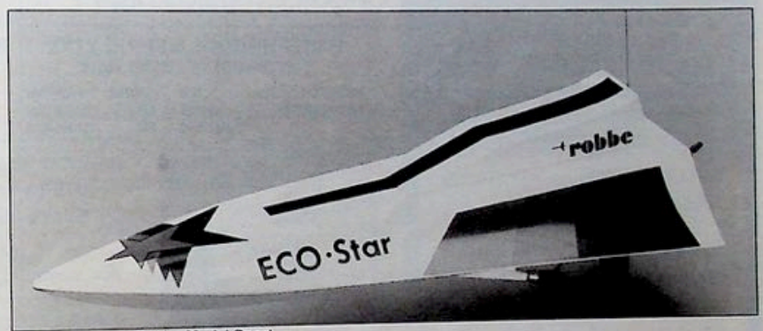
First there is the Mini-Drill. Using two C-cell batteries, it is capable of a top-end speed of 2500 RPMs. It comes with two different size drill bits, a milling bit for working soft materials such as wood, plastic and aluminum, and a stone grinder that can be used to engrave glass. Also included are three chucks and a wrench. It retails for $39.98.

The Battery Powered Scissors will cut through paper about as fast as you can move it. Again, power is two C-cells, and it will cut paper, cloth, styrene sheet, and thin cardboard. The cutting blades travel so short a distance that there is no danger of hurting fingers. The blades are heat treated to 58 degrees of hardness. Price is $13.98.

The Battery Powered Soldering Iron operates on four C-cells, and is ready to work in ten seconds after the power switch is pushed on. The tip pops into place with the push of a button, and retracts into its housing after use, making it extra safe in operation. An extra soldering tip and some flux-centered solder are included in the price of $14.98.

All of the Totex tools can also be operated using rechargeable batteries, and the soldering iron even includes an inlet for any charger with an output of 4.6 to 6 volts. An LED

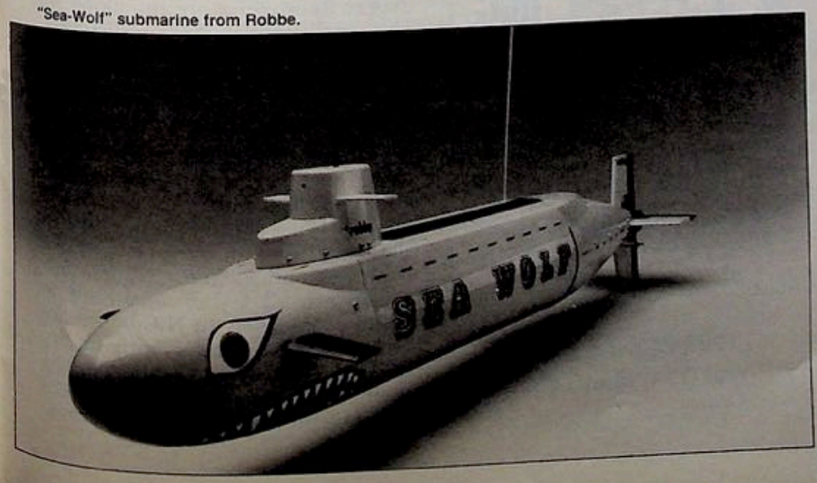
continued on page 77

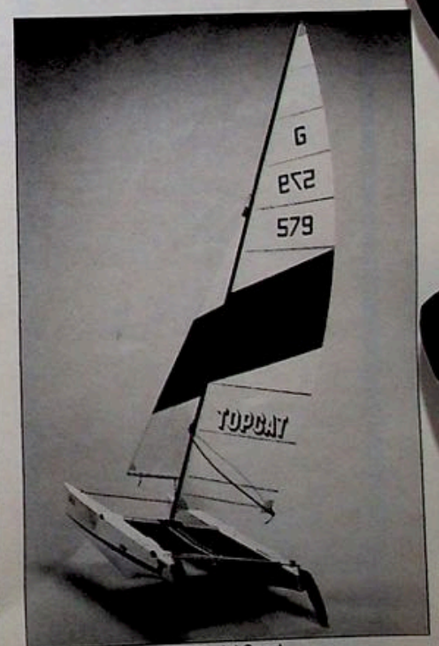


"Eco-Star" from Robbe Model Sport.

The Battery Powered Foam Cutter also operates on two C-cells. When turned on, the cutting wire is almost instantly ready to cut foam. Power consumption is low. A small screwdriver for inserting the heating wire, and spare wire is also included in the price of $13.98 for this tool.

"Sea-Wolf" submarine from Robbe.





"Top Cat" from Robbe Model Sport.

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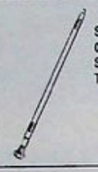

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MARA *Continued from page 51*

controlling will be done with the rudder. The sail angles are modified only to change the direction of the boat with respect to the wind. After a bit of practice, "Mara" will be maneuvering as freely as the R/C powerboats on the lake.

Happy Sailing!

WAVES *Continued from page 21*

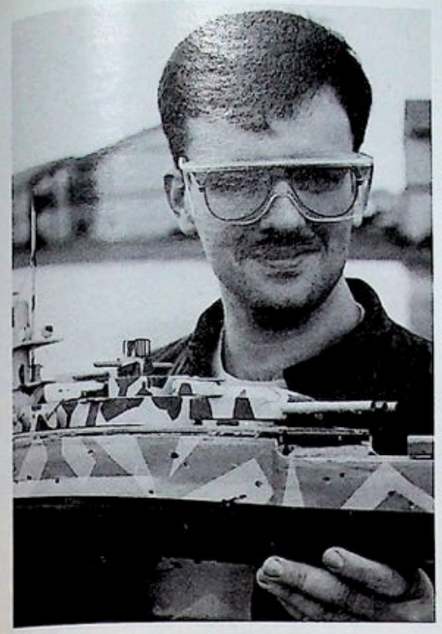
or Liters.

Let's see how our NiCd cells compare with another commonly used power source, the alkaline-manganese dioxide cell, referred to simply as "alkaline." The 1.2 mAH capacity sub-C NiCd is by far the most commonly used size for R/C power, but an alkaline cell is not made in that size, so let's use the equally well known "D"-size cell, the largest common type, for comparison purposes.

The ratings for the D alkaline are not all that well known, so let me give you those first. Actually it is quite an efficient little electron supplier, the "Duracell" D being rated at 14.0 AH capacity. In the same size, the NiCd comes in at only 4.0 AH. Running those and all the other related figures through the formulas gives us the following comparisons:

Alkaline D Cell:
Gravimetric Energy Density, 57.9 (WH per lb.)
Volumetric Energy Density, 5.25 (WH per cu.in.)
NiCd D Cell:
Gravimetric Energy Density, 13.71 (WH per lb.)
Volumetric Energy Density, 1.5 (WH per cu.in.)

As you can see, the NiCd makes a very poor showing in all respects compared to the alkaline. We can expect approximately the same results with other cells of similar sizes. For example, the full size C cell, in NiCd being rated at 1.8 AH, is capable of producing 7.0 amps in the alkaline version, and for the greatly used AA size, the ratings are 2.1 to .5 amps, in favor of the alkaline cell. However, fortunately for us, batteries of all types are in wide use all over the world; it is a very competitive business, and the battery manufacturers are all trying very hard to outdo each other. In NiCds, we are already using sub-Cs with an increased capacity of 1.7 AH and AAs good for .7 AH, no doubt we will continue to see yet more improve-



This battlers model of the DKM Lutzow has just been sunk! Don't worry about the BB holes in the hull, they were all given permanent repairs in just a few minutes time.

Have You

Taken any good SALVOS lately?

Discover the exciting new sport/hobby of RADIO CONTROLLED MODEL WARSHIP COMBAT, where your 1/144 scale model warship will battle other warships for control of the sea. Each model is armed with low power BB cannons that you control by radio to shoot holes in the soft skin of your opponents hull. If you show superior gunnery skill, you may even manage to sink the enemy, but BEWARE!, he is trying his best to sink YOU!!!

These models do not suffer any permanent damage from this seemingly destructive treatment. A warship model may battle and be repaired many times in a day, even if it gets sunk.

Whether you just battle in one on one engagements or as a member of a large fleet that is taking on another fleet, RADIO CONTROLLED WARSHIP COMBAT will give you a rush and thrill that cannot be matched by any other radio controlled model sport.

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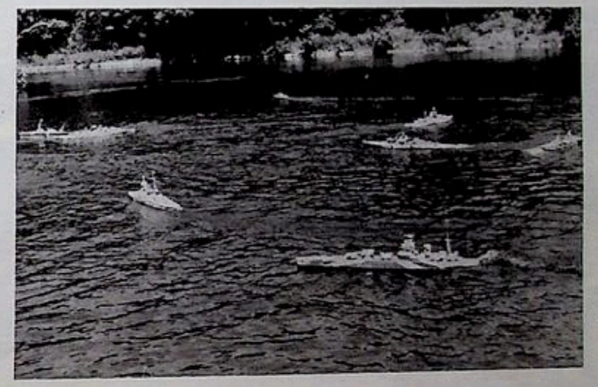
Available Sept. 1, 1989 will be exciting videotapes of recent R/C warship combat contests. These tapes (available in VHS only) will have warship model closeups, interviews with battlers, and lots of combat footage of ships exchanging BB salvos. These tapes will be available for rent or purchase.



The battle rages. Ships of the Allied and Axis fleets try to drive each other beneath the waves in order to secure control of the sea.

PLEASE WRITE TODAY for our new catalog of model warship kits, A.R.F.s, supplies, accessories, & videotapes and an information package on the new hobby/sport of RADIO CONTROLLED MODEL WARSHIP COMBAT. This info pack describes the ships, the battling, the history, and the organizations that currently exist to promote this most exciting of R/C hobbies that is sweeping the country. Just send $1.00 and a legal size Self Addressed Stamped Envelope to the address below.

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ments. Let's hope so.

Having gotten a little ahead of myself, I have already stated the reasons that the NiCd battery is king of the hill for R/C vehicle power. And there is no doubt about it, NiCds, even in single cells, pack a tremendous amount of energy, and some care must be exercised in their use. As mentioned, and as we know from experience in the field, they can produce extremely high currents. Just how much, you ask.

Well, let's go back to those watts we now know all about. First, however, all discussion of NiCd battery current, both in and out, is based on the individual cell capacity, referred to simply as "C." Thus we speak of charging a cell at 3C, i.e., three times its capacity. Or conversely, draining it at some multiple of percentage of its C. You might find it interesting that none of the NiCd battery manufacturers provide any data for use of their products at higher than the one-hour rates, either for charging or for discharging. This is, of course, far lower than what R/Cers are doing to NiCds, but then of course, the maker is also claiming hundreds of charge/discharge cycles, which most good NiCds will provide at the claimed values, while the R/Cer, especially the R/C car racer, doesn't seem to mind boiling dollars away as long as he is first across the finish line.

Anyway, such data is not published, but I was once told by a Sanyo sales engineer that a good quality, fully charged NiCd is capable of 100C under a full short. This means 120 amperes, which is a LOT of current. Stated in watts (voltage times current), that is 120 of them for a single cell, and 864 of them for a six-cell pack! We are all familiar with those amounts of electrical energy in other applications and know quite well what 800 watts is capable of when converted into heat energy.

That is where one of the potential dangers lie, in the heat that a shorted NiCd cell or battery is capable of generating in the wiring or whatever causes an external short circuit. The other is the possibility of a cell or cells exploding, as they themselves get extremely hot when called upon to produce that kind of current. Without getting all carried away on the subject, I must remind you that a short across a charged NiCd battery can ruin more than just your day!

Though not used at all in racing circles, there is yet one more rechargeable cell we need to discuss, the so-called gel (or gell) cell. That name too, like nicad, is a misnomer, in that gel/cell, without capital letters, is the registered trade name of the Gould Battery Division for its sealed, gelled electrolyte batteries. "Batteries," in this case is correct, as they don't seem to make individual cells, the most common single units of that type being made by Gates Energy Products in a D-size cell rated at 2.5 AH capacity.

There are a lot of makers of these types of batteries, which regardless of the name, are similar in that they are basically lead-acid units not unlike the older automobile batteries, the main difference being that the acid is not in a liquid form. Instead, it is "gelled" in some manner, the cells are completely sealed, and are described by their various makers as "sealed lead acid," "solid gel," "maintenance free," " immobilized electrolyte," etc., all meaning the same thing. They are made in a wide range of voltages and capacities, and properly used, can be a clean, reliable, and not unacceptable source of electric power for R/C models. In the gravimetric/volumetric race, they come in at:

If you want FAST right out of the box, no other electric even comes close to the **GP Marine Stinger**. Its unique Twinline Drive System turns all the energy of two rugged 550 motors into a long-lasting, water spraying rush of power. And the hull is designed to make the most of its speed with easy control. The Stinger is meant to race—and win.

Entirely pre-assembled except for a required 2-channel radio and battery installation, the Stinger continues blasting through the water after maneuvers that leave its competition bobbing behind. Apply the included decals for a sizzling scale appearance, and you're ready to fly! See your hobby dealer or write to us today!

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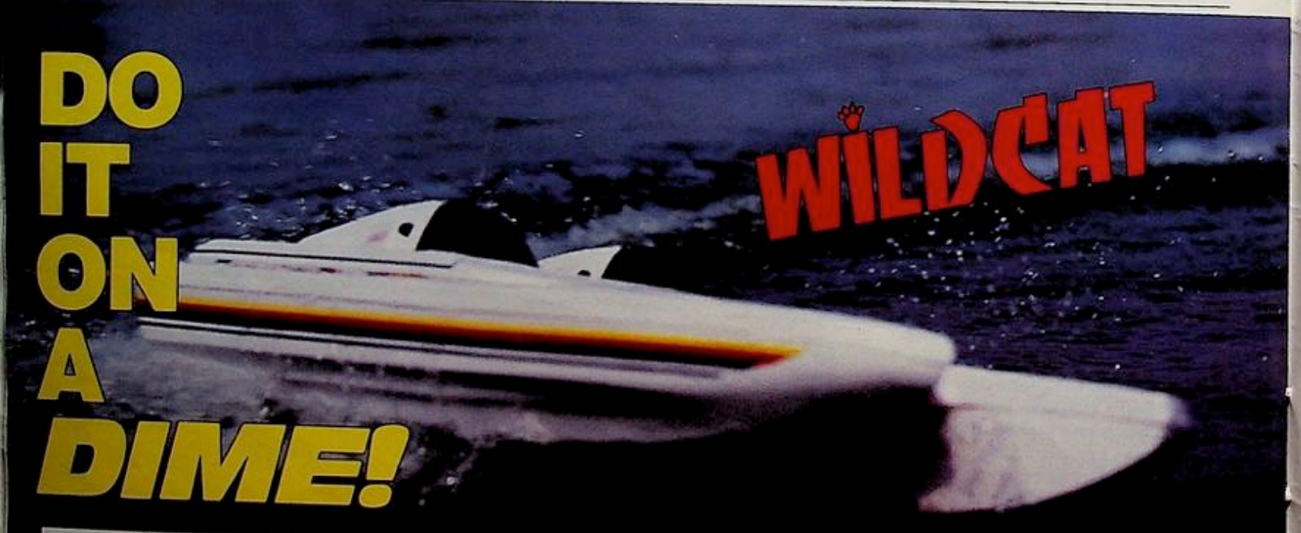

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Using the photo-illustrated instructions, you can be racing the WildCat in just a few hours. *Nothing* handles like the WildCat. Pilot this stylish twin, with flaming decals and picklefork bow, through the sharpest course: the WildCat will do it on a dime! See your hobby dealer or write to us today!

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Gravimetric: 12.5 WH/Lb, and Volumetric 1.4 WH/Cu.In.

The sealed lead-acid battery is not too popular with the R/C hobbyist. For racing applications, its internal resistance is far to high to obtain the currents and speeds possible with NiCd cells. For other uses, such as the widespread requirement for a 12-volt source for electric starters for glow plug engines, they have a reputation of being extremely short-lived. This is an erroneous and undeserved reputation, and the results of improper charging methods. Proof of this is that these batteries are the mainstay power sources for the security system industry, in which they are used in tremendous quantities to power intruder sensing and lighting units in the event of loss of the 110V commercial power. In the real world, this is considered more important than a radio controlled "toy," and if NiCds had any advantage, I have no doubt they would be used. The difference is that in security systems, these batteries are properly maintained, as opposed to use by the average modeler, who charges them with anything labeled "12-volt charger" and with the approach that if a little bit is good, a whole lot is really good. Sealed lead-acid batteries are not forgiving of being overcharged.

The use of these batteries in the security business has a side benefit for us. They are changed without question after a certain number of months of use, which results in large numbers of them, in all sizes and in perfect condition, being available on the electronic surplus market. Look for ads in the popular electronic magazines for these sources. They are an excellent source of power for scale boats for which speed is not the primary consideration.

As stated, proper charging is important, but not exceptionally critical. For those of you who like to build and experiment, I have an excellent charger circuit for these batteries, which I will share with you upon receipt of your SASE.

There you have it... batteries for R/C boat power. If you have any further questions, or wish to share any of your experiences with others outside your local pond, you can write Eloy Marez, 2626 W. Northwood, Santa Ana CA 92704. •

ACE *Continued from page 24*

ceiver; less costly versions come with the Silver Seven system's seven or five-channel receiver. For the past two years the model magazines have been advertising systems that are suitable for use in 1991 when many more R/C frequencies become available for our hobby use. A set of very tight operational guidelines for transmitters and receivers has been established. The Nautical Commander transmitter meets those rigid requirements. The Model 91 receiver doesn't yet pass our lab testing, although you should expect no interference or glitches from other boaters. There are many receivers in use that don't meet the tight specs. Of prime importance is the fact that R/C systems for surface use (like this review radio) *do not* have to meet these tight guidelines, but by doing so the chance of interference from non-R/C transmissions is decreased greatly.

The lower cost versions of the Nautical Commander use five channels, omit the on-off switches, use a less sophisticated receiver, and don't use the high capacity fast charge battery packs... all in varying combinations to fit your hobby budget. We

continued on page 66

PRODUCT SURVEY

BY JERRY DUNLAP

DUMAS "HOTSHOT SPRIT 3.5"

What is this, you ask? Jerry reviewing the new 3.5cc outboard tunnel from Dumas Boats that he designed? What the heck, why not? I've reviewed plenty of other boat kits by other manufacturers. When it comes to offering a variety of model boats ranging from cabin cruisers to unlimited hydroplanes, Dumas Boats, "The Model Boat People," covers the spectrum.

The "Hotshot Sprint 3.5" incorporates the latest design ideas I've been using on my model tunnels. Like other wooden tunnel kits from Dumas Boats, this kit features die-cut wooden parts for the framework and sheeting.

However, there is a new feature on the "Hotshot Sprint 3.5" not found on previous kits. The enclosed cockpit cowling is of ABS plastic. This saves building time as well as providing a scale appearing cowling. A detailed set of plans, building instructions,

(Above) The Dumas "Hotshot Sprint 3.5" designed by RCMB's contributing editor, Jerry Dunlap, shown with the JR Alpina PCM 2-channel radio from Hobby Dynamics. (Below) Yes, it do go fast!

and construction photo sheet, provide plenty of information for a first-time model boat builder. There is even a hardware kit for the steering and throttle linkages

Instead of giving a "part by part" account of the building sequence, I'm going to provide some comments to supplement the building instructions provided with the kit. I would recommend using a one-inch circle drill to cut holes in the sponson frames. Take the time to sand the edges of the frames so they are flat. Die-cutting tends to leave a slight bevel on the edges of the frames.

When assembling the framework, be sure to fill the gaps between the frames and cockpit sides where they join together. The die-cutting of the notches leaves a rather loose fit in some areas. Extra thick CAs like Hotstuff "UFO" Green (thick), and Kick-It spray accelerator work well for fast and strong gap filling. I use thick CAs for gluing the framework together as well as attaching the sheeting. I like to use Hotstuff "UFO" Red (thin) to run along the inside of the glue joints as it will penetrate any small seams.

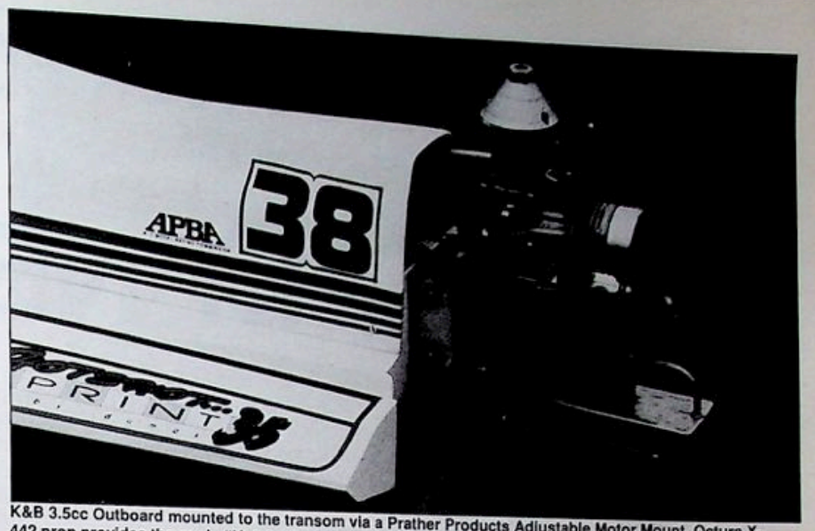
The most important aspect of assembling this kit is building the framework straight. A building jig is included with the kit to assist in this facet of construction. Take the time to do it correctly because it makes the difference between a boat that just runs and one that runs really well.

Sealing the inside of a wooden boat is just as important as painting the outside. I use K&B Super Poxy Clear to seal the interior of my wooden boats. The interior of top sheeting pieces is given a coating of K&B Clear prior to gluing to the framework. I sand the clear lightly before gluing in place.

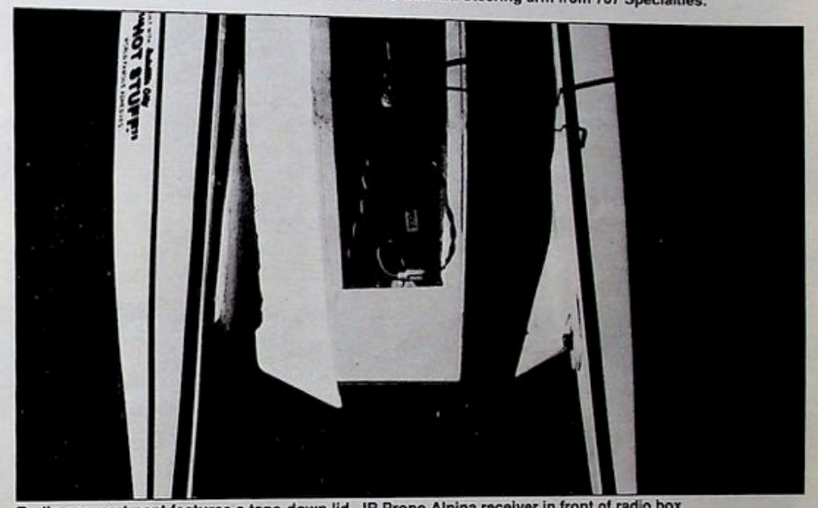
In the past, I've experienced some problems painting over ABS plastic. Actually, the problem wasn't painting over the plastic, the problem was paint not sticking because the plastic was so smooth. I sanded the entire plastic cowl with 200 grit and knocked off the shiny finish. The cowl was then sprayed with K&B Super Poxy primer, sanded, and sprayed with Super Poxy white. The cowling shows no signs of peeling.

The radio box lid on the "Hotshot Sprint 3.5" features a tape-down sealing technique. A tape that works quite well is "Tuff Tape" by Scotch. I have found it in drug stores as well as grocery stores.

When it comes to finishing a model racing boat, I've always tended to go with simple paint schemes... paint it one color and grab a batch of peel-and-stick decals. While browsing around the model car section of a local hobby shop, I ran across a product for trimming model cars I hadn't seen before. It is called BodyShop Pinstripes by Coverite. A single color of pinstripes comes on a sheet with five widths ranging from 1/16 to 1/4 inch for a total of 50 feet of stripes. The color is on both sides (it's primarily intended for use on the inside of Lexan car bodies), adheres to a painted wood surface really well, and can be easily curved or angled. It also appears to be hot fuel proof, but I must admit I haven't intentionally dumped 60% fuel on it. Compared to other model striping products, BodyShop Pinstripes is priced very well. It comes in the following colors: red, white, black, blue, yellow, gold, and silver. I'm very pleased with the way the stripes finished off my "Hotshot Sprint 3.5."



K&B 3.5cc Outboard mounted to the transom via a Prather Products Adjustable Motor Mount. Octura X-442 prop provides the push. "Hotshot" decal comes with kit. Steering arm from 707 Specialties.



Radio compartment features a tape-down lid. JR Propo Alpina receiver in front of radio box.

The radio system used In my "Hotshot Sprint 3.5" is the JR PROPO Alpina PCM 2-channel distributed by Hobby Dynamics. The servos provided with the system proved more than adequate to handle the control demands of this type of model boat. A little more information on this radio system can be found in the "Products Survey" on the CESA 1882 in this issue. I have experienced excellent results with the Alpina Beat 2 system in 3.5 powered boats during the last three years. I'm confident the Alpina PCM will provide the same reliable service.

I have had the opportunity to run my "Hotshot Sprint 3.5" on a number of occasions and even got in some fun racing with the boat. I am pleased with the performance of the boat. While racing against other 3.5 tunnels at a club Fun Run, the boat exhibited good straightaway speed and fine cornering characteristics after doing a little playing around

continued on page 74

R/C POWER BOATS

BY JERRY DUNLAP

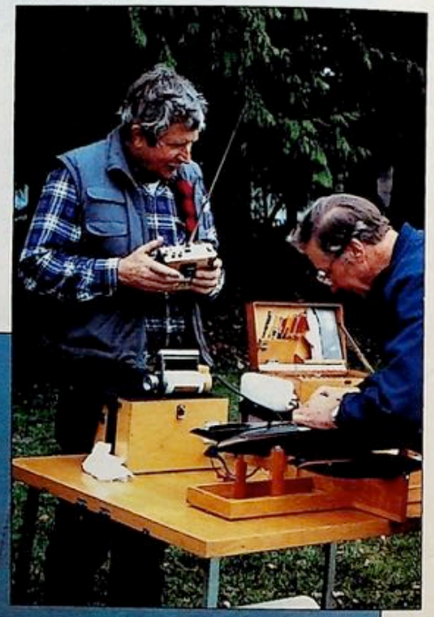
STRAIGHTLINE FEVER

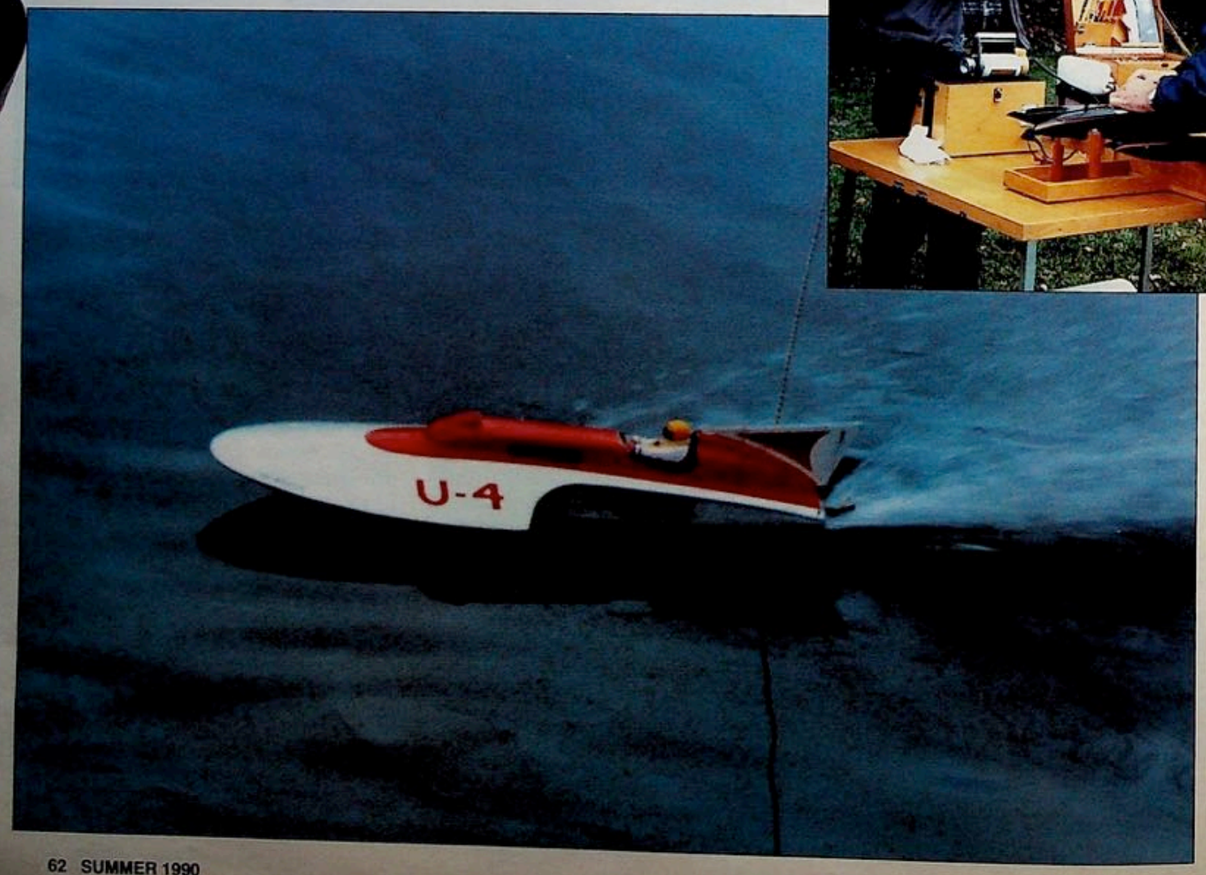
No, this isn't going to be an article on some new virus causing high temperature, headache, and post nasal drip. "Straightline Fever" is a rather strange malady infecting model boaters desiring to see how fast they can make a miniature water craft go between two points located 1/16 mile, or feet apart. Symptoms of this illness may include an itch to "tweek needle valves," breaking out of seldom-used high-pitch propellers, and an uncontrollable urge to pour massive amounts of highly nitroed fuel through two-cycle engines. A side effect could be construction of weird appearing model boats with no other practical purpose other than going fast in a straight line.

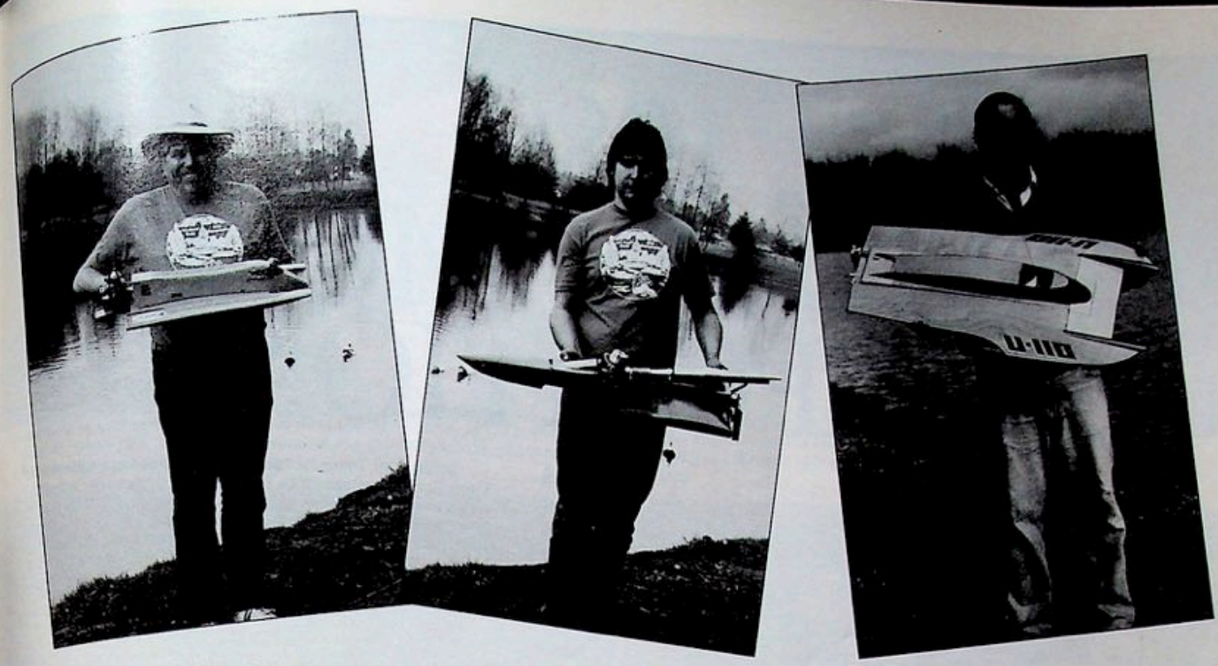
Over the twenty-five years I've been involved with model boating, this affliction has struck me down on numerous occasions. I came down with a bout of it again this past April when a net 3.5cc foam tunnel I had built for Dick Roberts, APBA R/C Model Racing Commission's Outboard Chairman, showed serious signs of breaking the 3.5cc Stock Outboard Tunnel record for straightaway speed. In mid-March, Dick took the boat to a record trials in Wichita Falls, Texas and ran within two miles of the record the first time his boat hit the water.

A serious case of "Straightline Fever" struck Dick and he was anxious

(Below) John May preps his record-holding 11cc Hydroplane, powered by an OPS 65, as Jim Auguston stands by with the transmitter. (Bottom) Pete Schille's Electric Thunder "Miss Burien" set records in both six and twelve-cell electric. Averaged 35.601 mph with twelve cells powering an Astro Flight FAI 05 motor turning an Octura X-432 prop.







(Left) Dick Roberts, Outboard Chairman of the APBA R/C Model Racing Commission, has a reason to smile. He has just set a new straightaway speed record average of 47.568 mph with his stock 3.5cc Outboard Tunnel built by Jerry Dunlap. (Center) Mark Anderson, Olympia, WA, should be smiling. He set a new 30cc Hydroplane speed record with his Picco Hydro 90 powered, Evergreen Boats Fisher Canard, of 79.78 mph. (Right) Rod Geraghty makes building boats of wood instead of fiberglass look worthwhile. This variation of the Dave Frank Sport 40 (featured in the Summer 1987 issue of *USB&SM*, won Best Sport Hydro trophy at 1990 Northwest Model Expo, in Puyallup, WA, and runs as good as it looks.

to get another chance at the record. He contacted me shortly after the Texas record trials to relate how well the boat had performed and inquire whether I was planning to attend the record trials being held in my district the first weekend in April. I told him I was giving it serious consideration. Dick said he'd be interested in flying up for the event. Now flying to a model boating event isn't a real big deal for Dick, as he owns his own airplane. With my design running so well, I certainly didn't discourage him. I offered a place to stay if he could make it up. Dick said he'd be there if the weather was favorable.

On Friday, March 30, Dick made it as far as Olympia in his airplane, rented a car, and drove the remaining 25 miles to my place. Although he now lives in Albuquerque, New Mexico, Dick spends his high school years in the community where I currently live and teach. Small world at times. After a Friday night of serious bench racing, we were ready to cure our "Straightline Fever." I had prepared a 3.5cc tunnel like Dick's and also my 7.5cc tunnel.

Early Saturday morning we headed up I-5 in Dick's rented compact wagon to the record trials running site just north of Marysville, Washington. The weather looked like it would be ideal. It was slightly overcast, cool, and no wind. However, when we arrived at

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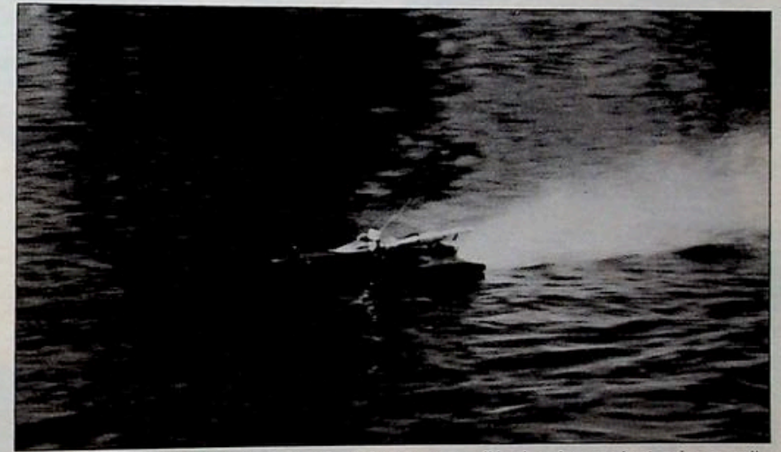
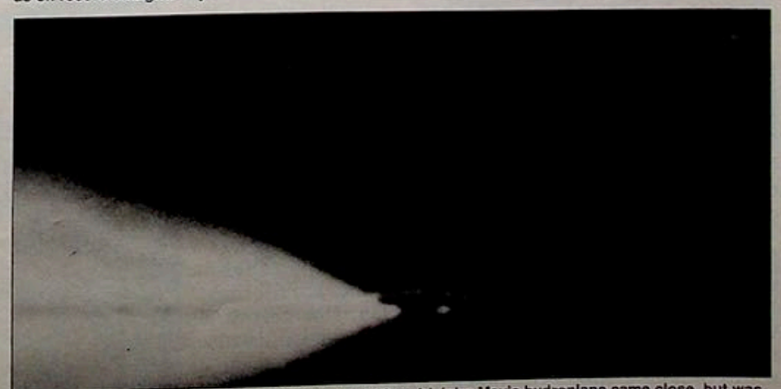


Mark Anderson's Evergreen Boats Fisher Canard works very well in closed course heat racing as well as on record straightaways.



Not easy to catch a model race boat doing about 90 mph! John May's hydroplane came close, but was not able to up its own record of 91 mph. Some rooster-tail!

1989 CALGARY MODEL EXPOSITION

BY AL HOBBS

(Below) "Mr. Pringle's" scale unlimited hydro, built from a Steve Muck fiberglass kit by Dick McClay, Edmonton, Alberta. Had not yet been raced at time of expo. (Bottom) Fiberglass catamaran "Jesse James" was built by CMBRA President, Keith Wartham, and displayed with photos of the actual racing catamaran in action. Keith races this boat in District Enduro and Offshore events.

Keith Warham, president of the Calgary Model Boat Racing Association, called me. "Why don't you come up to Calgary on November 18 and 19? You can help us work our booth at the Calgary Model Exposition." Keith can be very persuasive and talked me into driving more than 300 miles to see this excellent hobby show.

From its roots as a model railroad display, the Calgary Model Exposition began growing. In 1985, most modeling hobbies joined with the model railroaders to fill the large Calgary Leisure Center. By 1988, the Leisure Center was overflowing, and in 1989 the modelers moved into an even bigger facility, the Big Four Building at the world famous Calgary Stampede Grounds.

The Calgary Model Exposition is designed to help interested people get into model hobbies. Visitors pay $4.00 admission and vote for their favorite displays. The various clubs share part of the admissions to help fund their club projects. No "Best of Show" or other individual awards are involved. It is strictly a hobby show to attract new hobbyists.

Near the Saddledome, home to the Stanley Cup winning Calgary Flames hockey team and site of the 1988 Olympic Hockey games, the Big Four Building offers excellent facilities. This building had to be big to handle the 9,000 plus visitors interested in the hobby show. After driving 300 miles to Calgary, the easy parking and exhibit access was very welcome.

Each hobby club in the Calgary area had its own display booth. Instead of one model airplane display, there were several. One of the local car racing clubs built an offroad track complete with jumps and hazards. The frequent car races kept the crowd entertained.

Several boats were put through their paces on a temporary pond. From the graceful radio controlled paddle wheelers, to submarines, to steam powered vessels, to quick electric sportfishing designs, this pond was always busy. Radio controlled sailboats could float in the pond, but, as there was no wind indoors, they could not really show their stuff.

Many displays of museum quality scale models drew respect from the crowd. Alongside the finished scale three-masters were partially built boats as construction examples. Bert Van Hilden, Calgary modeler, explained just how he gets those sailboats in a bottle. In the next display,

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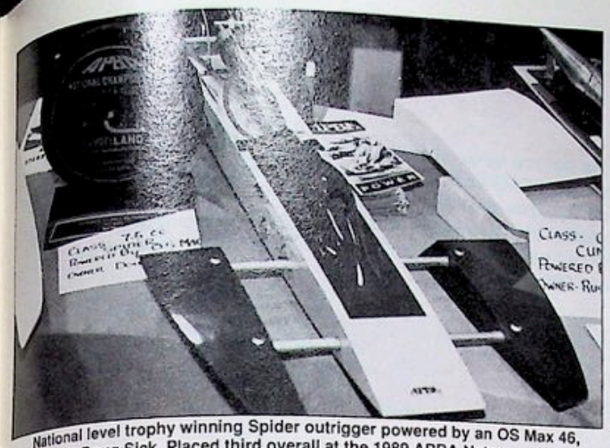
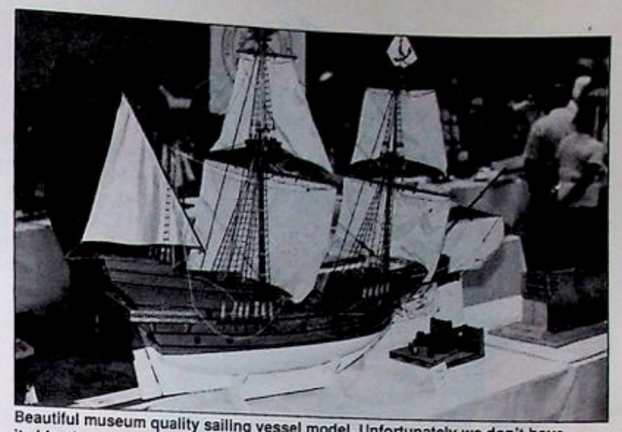
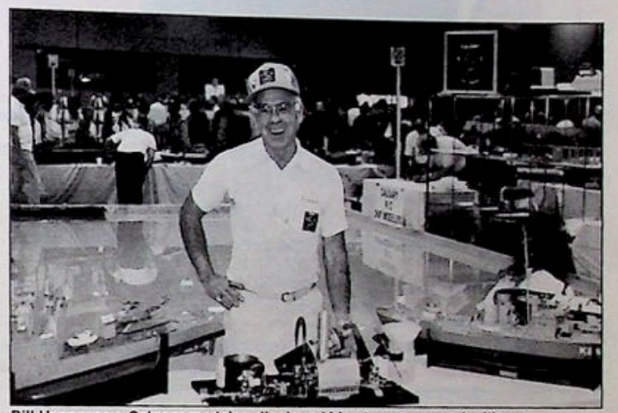


National level trophy winning Spider outrigger powered by an OS Max 46, built by Doug Sick. Placed third overall at the 1989 APBA Nats, and is also the 1989 Canadian APBA Champion.

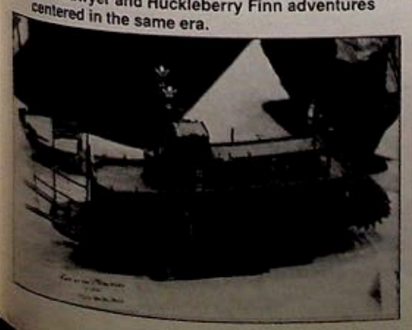


Beautiful museum quality sailing vessel model. Unfortunately we don't have its identity or the name of the builder.

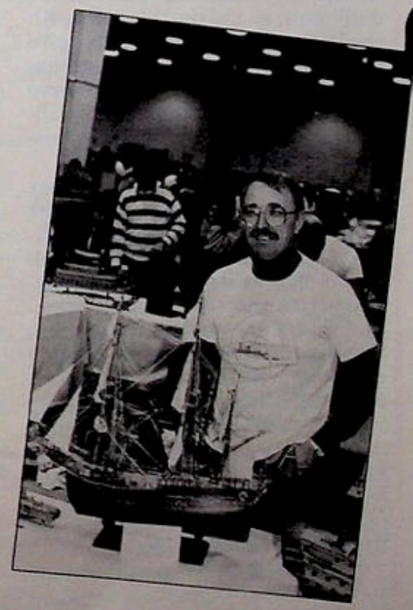
An indoor pond is always an attraction at a model show. Limited to electric and steam (there wasn't too much wind, and gas power was prohibited), there was still plenty of action with a submarine and a steam powered vessel equipped with an operating steam whistle.



Bill Hennessey, Calgary modeler, displayed his steam powered military vessels. Steam engine in front is a V-twin, double acting design, operates at 30 pounds pressure. Has 5/8-inch bore and three-inch stroke.



Exact scale model of the "King of the Mississippi" built by Marie Van Den Berg. Mark Twain's Tom Sawyer and Huckleberry Finn adventures centered in the same era.



Bruce Ellis, Calgary, with his scratch-built HMS Endeavor. Used mahogany, cherry, maple, and basswood in its construction.

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ACE *Continued from page 59*

measured transmitter drain at 155 milliamps, so the upscale cells with the Deluxe Version could safely give four to five hours of use. The large encoder board that also has the servo reversing switches has been well-proven in the Ace model airplane transmitter.

Our photo sequence shows how easy it is to solder the servos' wiring to the supplied Deans connectors. WARNING: Don't use an instant-heat soldering gun as its radiation can demagnetize the servos' electric motors. Use a low wattage (33 watts is ideal) pencil-shaped, slow heating soldering iron. If you're not comfortable with soldering, let a friend help you. If you're electronically inclined, Ace R/C has a very extensive line of kits that includes full R/C systems, servos, receivers, chargers, measuring equipment and a thousand other items we'd all like to have.

Your local hobby shop will be happy to order Ace R/C products for you if they're not already in stock... it only takes a week usually. As you'll see in the photos, the inside of the receiver has two boards which join with four color-coded wires. One of the boards is fairly simple to assemble—the other is a bit crowded like today's hi-tech receivers. Study the photo and you can decide if you'd like the fun and economy of building from an Ace R/C kit.

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DESIGN *Continued from page 27*

marans are seldom used in closed-course racing because in light air they sometimes don't have enough inertia to carry them across to the other tack or around a buoy. It was most frustrating to have CL Max suddenly start drifting backwards instead of filling away on the new course. Another disadvantage, of course, is that if a catamaran is blown over in a squall it stays down and is all through with that race. Keel boats come back up.

Aside from these problems, the advantages of catamarans are obvious. In light winds the sail is always straight up for maximum efficiency, and in moderate winds one hull lifts off, greatly reducing the drag. Sailing on one hull is fairly critical, however. An unexpected additional gust and over it will go! An experienced crew on a full-size cat can usually avoid upsetting, but a model cat skipper on shore is at a disadvantage. The radio helmsman can't evaluate the gusts as well or respond as rapidly. Of course, automatic sail trimming, as I have previously recommended in this magazine, solves that problem.

Having no keel, catamarans can operate in much shallower water than keel boats. "No keel" is a bit of a misnomer, however. All sailboats must have some kind of a "keel" to develop the lateral force necessary to keep the boat from drifting sideways downwind. Cat designers normally make sharp deep hulls that resist sideward movement. This is not an efficient solution, however.

Remembering our discussions of aspect ratio, the aspect ratio of a deep cat hull acting as a keel fin is

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lousy! The resulting induced drag is high. The cat hulls for CL Max were shallow and rounded on the bottoms, and I provided separate high-aspect-ratio keel fins. I was not concerned with deep draft but was concerned with drag.

WEIRD HULLS

Following my earlier argument that what we design doesn't have to look like a conventional sailboat, there are many ways that we can improve model hulls, in theory at least. Let's talk about the part of the hull above water first. Its shape might not seem important because it is out of the water. True, but it is not out of the air, and air is what drives our boats. Water is what holds them back.

Repeating some of what I said in my wingsail article in the Winter 1989 issue of *U.S. Boat*, not only is it very important to seal the sail against the deck if at all possible, but it is important to conduct the airflow over the hull as *smoothly* as possible to reduce the drag and to improve the flow over the lower part of the sail. Railings are to keep people from falling overboard. Railings are nothing but drag and turbulence on a model boat. So are square edges between sides and deck. The sides should round gradually onto the deck so it is impossible to tell where one ends and the other begins.

Below the water line, you probably understand the advantages of deep bulb keel weights and hydrofoil or airfoil-shaped keel fins. To review, the lower the keel weight (lower down, George, not lower in weight) the greater the resistance to heeling for a given weight. The keel fin should have a high aspect ratio and have a good foil cross section for good hydrodynamic efficiency. The job of the keel fin in resisting leeway is very important. A keel fin that doesn't develop sufficient force will permit excessive drift to leeward, decreasing our ability to beat into the wind. A keel fin with a poor lift-to-drag ratio (as the aero boys would say) will reduce our boat velocity.

Some of you may not have realized that in order for the keel fin to develop its leeway-countering force it must operate at an angle of attack. We see that angle in sailing as the angle between the boat heading and the true course.

Now comes the side effect. This yaw angle means that the flow around the hull and along the bottom is skewed slightly. That needn't be a serious problem, but many old time sailboat designers didn't recognize it and screwed up their designs as a consequence.

My point is that the lines of the bottom should be smooth and rounded, not sharp. Think of that skewed flow across the bottom. Do everything you can to keep it smooth.

A sharp keel line the length of the hull will cause turbulence and drag in the skewed flow. The keel fin, rudder, and separating hull are very comparable to an airplane wing, stabilizer, and separating fuselage. We don't build sharp ridges on the sides of fuselages and shouldn't on sailboat bottoms for similar reasons.

Especially bad are hulls with skegs that go from the keel to the rudder. The wetted area is unnecessarily high, the skewed flow becomes full of eddies, and the low aspect ratio and senseless shape of these old-style keel fins causes excessive induced drag. Use a high-aspect ratio foil-section keel fin and a high aspect-ratio rud-

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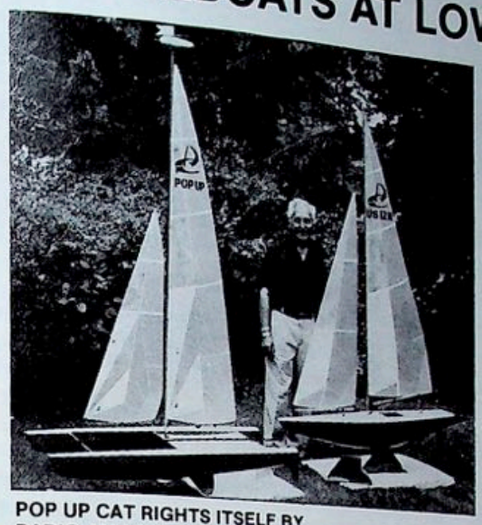

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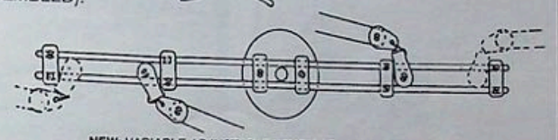

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ter that has no fixed skeg in front of it. The only disadvantages to these are a requirement for a little water depth and a tendency to snag weeds.

HULL RESISTANCE

On any normal hull, wavemaking drag is a very major part of the total resistance. A nineteenth-century English naval architect named William Froude found that the longer the hull, the faster a boat or ship can travel without excessive wavemaking drag, and that the wave drag coefficient varies inversely as the square root of the hull length. The wave drag on a given hull goes up gradually with increasing velocity to a certain point, then it rises steeply. The velocity in knots divided by the square root of the hull length in feet is called the "speed-length ratio." It happens by chance that a speed-length ratio of 1.0 usually falls at the beginning of the knee of the drag curve, where the wave drag starts increasing sharply. A somewhat higher velocity, at a speed-length ratio of, say, 1.25 to 1.4, is called the "hull speed" of the boat. Travelling faster would take excessive wind for a sailboat, or require excessive fuel in a powerboat. The total hull resistance at a ratio of 1.4 is usually two to three times as much as it is at 1.0. Figure 2 shows the total drag of my old M-class model hull "Arrow," according to my tests of 1954.

Measuring the drag of any model hull is very easy, by the way. Simply measure out a hundred-foot course along a low dock or bulkhead, tie a spring scale of appropriate capacity in a line to the bow of the hull with the sails off, tow the boat at a constant pre-selected value of drag on the scale, and time yourself over the 100-foot course. Make runs at a number of different values of drag, and record the data. Each final data point should be the average of runs in both directions of the course to cancel out any current or wind effects. I used ounces and feet per second, but the units can be converted to anything you wish. Plotting the drag vs. velocity curves of several hulls on the same sheet permits a direct comparison of their drag characteristics.

FINENESS RATIO

Designing longer, narrower hulls for greater speed-length ratios is usually fruitless. The structural weight of a longer hull goes up and the surface area and therefore the skin friction goes up, so the resulting speed may be less rather than greater. We call the length of a hull divided by its beam its "fineness ratio." Chocolate lovers say, "Too much chocolate is just right." That does not apply to fineness ratio. This is an example of the compromises that must always be made in design.

SUBMARINE DRAG

Submerged submarines have far less resistance than floating ships of equivalent tonnage, because submerged subs don't make waves. I ran tests on a streamlined test hull years ago, both with it floating one-third out of the water and with it submerged six inches below the surface. It had a drag of four ounces at a velocity of 2.75 feet per second when floating (making waves). When it was submerged (no waves) its speed went up to 4.21 feet per second at the same four ounces of drag, even though it was then heavier to make it sink and the total displacement was greater!

KEYHOLE HULLS

These facts lead us to an interesting approach to minimizing the wavemaking drag of our model sailboats. We could minimize the size of the hull at the water line, keeping most of the displacement well below

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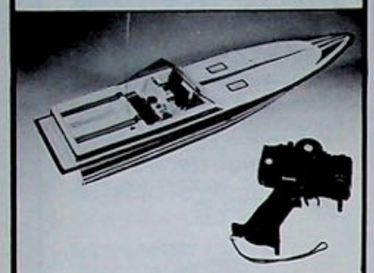

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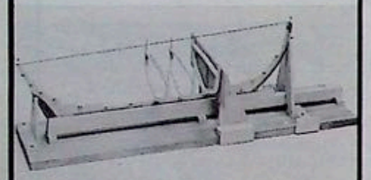

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the surface, much like a surfaced submarine. A cross section of such a hull might look like an old fashioned keyhole with the narrow part up. The submerged bow would be rounded, for minimum drag, like the leading edge of an airfoil. The bow of the stem which pierces the surface would be sharp like a normal bow, however, since sharp bows at the surface minimize wavemaking. On an R/C model racing sailboat this surface-piercing stem might be about an inch wide and six inches in waterline length.

Don't be concerned about the short length of this stem. It is true that making a floating hull longer at the water line decreases the speed-length ratio, but the floating stem here is very narrow as well as very short compared to a normal hull. It would operate at a high speed-length ratio due to its very short waterline but its drag will be very low, due to its very small beam. Its wave drag would be roughly equal to a miniature hull six inches long with a one-inch beam! The skin friction of the entire keyhole hull would be roughly comparable to that of a conventional hull of the same displacement, but we would have eliminated most of the wave drag.

Large ships often approach this concept in a small way by incorporating a large bulb below the waterline at the bow, which serves to increase the displacement without increasing the wavemaking drag. The idea can't be carried to extremes on full-scale boats, however, because of passenger or cargo requirements. Passengers like big decks to walk on and portholes to look out. Submarine travel is not widely appealing. The tonnage of a freighter will vary over a wide range, so a keyhole freighter design would obviously have to have a very tall stem to keep the ship from sinking when loaded and from exposing the bulb part of the hull and increasing the drag when running light.

DOWN BY THE BOW

The force of the wind up on the sails provides a "couple" with the hull drag down in the water, which tends to push the bow of any sailboat down a bit, particularly when the boat is running before the wind. Heel is a roll angle; this is a pitch angle. In a normal sailboat the long waterline limits this bow-down angle to a small value. With a keyhole hull, however, the down-by-the-bow angle could be much greater since the waterline length of this freak hull would be very short. In practice the after portion of the submerged hull would tend to partially surface in a run, thereby limiting the negative pitch angle. In my opinion the wave drag which would be developed as a result of part of the after-hull being awash in runs would be small compared to the overall reduction in drag from keyhole hulls. It is a factor which should be taken into consideration in any such design, however.

ARTICULATED KEELS

On a reach, or a beat, a conventional boat will heel. The keel weight, which is rigidly attached to the hull, shares the heel angle and provides a righting moment which balances the upsetting moment due to the wind force on the sail. Simple and reliable, but not very efficient. The heeled sail presents less projected or effective area to the wind, and therefore less drive than it would if we could hold the sail straight up at all times.

One way to eliminate most of the heel under most conditions is to articulate or hinge the keel with respect to the hull. Far out? Sure. But workable, and a way to sail faster.

We obviously can't simply hinge the keel and nothing more. The keel would then hang straight down even when the boat heeled, and the boat would continue to roll to its side. What we would have to do is put a servo system on the keel which senses the start of heeling and cranks the keel fin and weight up at an angle on the windward side sufficient to counteract further heeling. This is illustrated in Figure 3. A keel-actuating arm inside the hull could be attached to a slightly-angled shaft which passes through watertight bearings to the keel fin, or the arm could swing in a transverse well in the hull. A pair of mercury switches could serve as heel sensors.

This system would hold the boat to a constant small heel angle in all winds. The component of heeling force due to mast and sail weight is eliminated when the sail is straight up, therefore, for a given keel weight and depth, an articulated keel fin would operate at somewhat less heel angle than would a fixed keel fin. The keel fin as well as the sail would therefore operate more efficiently.

AUTOMATIC HIKING WEIGHTS

Another approach to heel prevention is to swing an above-deck weight athwartships by a heel-sensing servo, much like the weight of a crew as they scurry to the windward side of the deck. This "live weight" system would be technically superior to an articulated keel below, but more difficult to make reliable. In this case most of the heel-countering weight would be above deck and would there-

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fore not add to the hull drag. The aerodynamic drag increase would be negligible by comparison. The configuration might be similar to Figure 4.

The difficulty here is in getting the moving weight to move fast enough to prevent capsizing when the wind changes sides suddenly. With a centerboard boat, if the crew doesn't get on the high side fast enough they go swimming. In our model we could use some fixed keel weight to reduce the danger of an upset, but the greater the ratio of live weight to fixed weight the more the gain. This configuration does another desirable thing for us. It moves the center of gravity back a bit in a run, when there is no heel, to counter the diving moment due to the forward wind force on the sail.

HYDROFOIL SAILBOATS

Hydrofoils are high-tech and appealing to creative designers, but I question their overall value for sailing. Hydrofoils have a little less drag than planing hulls under optimum conditions, but they introduce a host of problems. Notice that the racing powerboats are still using planing hulls, not foils. On racing sailboats there would be still more disadvantages.

The real advantage of modern hydrofoil boats is their smooth ride in rough water, since the foils operate below the surface. Because the foils are below the surface, however, a foil-supported sailboat would be very tender in both roll and pitch. But my biggest objection to the use of hydrofoils on model sailboats is the fact that most of our racing is done in gentle breezes that would be too light to get the craft up on the foils. This means that most of the time we would have the drag of the hull plus the drag of stalled hydrofoils. Foils are an interesting approach to a sailboat speed record attempt, but not for racing, in my judgement.

RECOMMENDED READING

For those of you who are seriously interested in the physics of advanced sailboat design, I recommend *Sailloons and Fliptackers* by Bernard Smith. It is available for $29.70 postpaid from: Order Department, American Institute of Aeronautics and Astronautics, 370 L'Enfant Promenade S.W., Washington, DC 20077-0820.

PARTING WORDS

The above ideas occur to me at this time. There are doubtless many other creative possibilities for making sailboats go faster. I invite those of you who are not bound by tradition to devise and experiment. It is to me the most fascinating aspect of the R/C sailboating hobby.

Finally, I have a puzzle for you. We have a wind-driven, wheeled land vehicle, with a windmill mounted on it in place of a sail. The windmill is geared to the wheels and the gears can be shifted. Figure 5 illustrates the machine we are talking about. With optimum design, could this vehicle sail directly into the wind and could it sail faster than the wind downwind? Maybe I can get our Editor, Bill Northrop, to publish the answers in his Cap'n's Log in the next issue. •

MIRAMARE *Continued from page 35*

kit weighs 3.75 pounds. In light winds, this weight was fine. Winds above seven knots caused the boat to heel too much and resulted in lower speeds than the boat is capable of achieving. Calculations run on my computer indicated that a keel weight of about five pounds would be better suited for this yacht with its tall,

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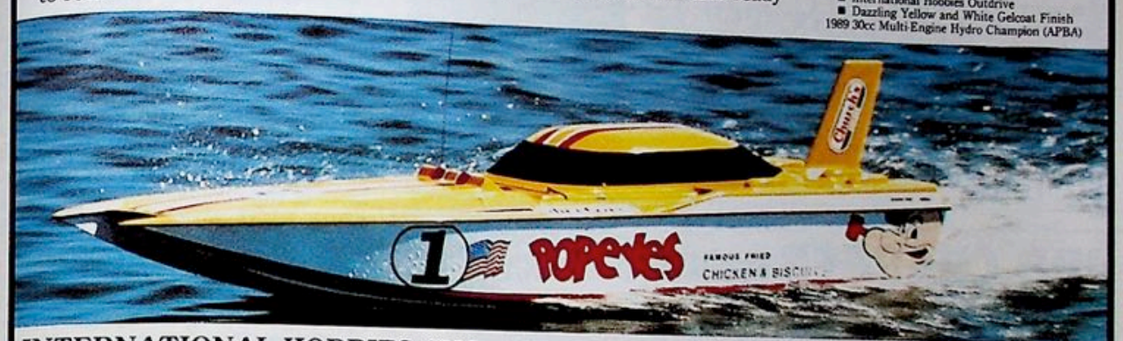

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narrow sails.

The suit of sails provided are to Europeans' likes. They are paneled Mylar sails. Workmanship and sewing were excellent. However, in light winds the panels were stiff and would not instantly change shape when the boat was tacked. Due to the stiffness of the Mylar there was often a few seconds delay in the sails assuming an airfoil shape. Lighter weight material would correct this problem. Lighter weight material would also wear out faster in heavy wind conditions. Again, this boat was designed and built for conditions in Europe, which are slightly more robust than those in America. Keep in mind that this is a European kit designed for their conditions and class specifications. To conform to the AMYA One-Meter class sail specifications, the sails will have to be modified by trimming the roach area slightly.

If you're not sure about the strange photo, just turn the magazine upside-down. Now the actual boat is on top, and the reflection, along with that of the barn, are seen in the mirror-like water. Not a great day for sailing, but nice for picture taking!

In spite of the few drawbacks noted, the Miramare is an excellent kit for the hobbyist who likes to build and appreciates European design and craftsmanship. The boat will provide many years of enjoyable leisure sailing for its owner. With slight modifications and light building practices, some unnecessary weight can be eliminated. The reduction in weight will increase the Miramare's performance to the delight of the owner. For a commercially mass produced kit, Graupner offers outstanding quality, excellent instructions, exceptionally fine fittings and snappy performance. •

CESA *Continued from page 37*

sides the wind. The roll of film wasn't 36 exposure as I thought, so we only got one running shot before running out of film. Of course, I left the extra roll at home.

Even though we were out of film, there were still a couple of battery packs to run down. The CESA 1882 was really quite a performer on the rough water. The boat had to be doing over 20 mph and bouncing off the waves just like the full size boat does in an offshore race. The surface piercing drive system exhibited considerable cavitation as the boat was getting up on plane. However, once up and running this drive system does allow the boat to achieve a higher top speed because the prop is running half submerged. There is a price for this speed and that price is a running time ranging from 2-1/2 to 3 minutes at full speed.

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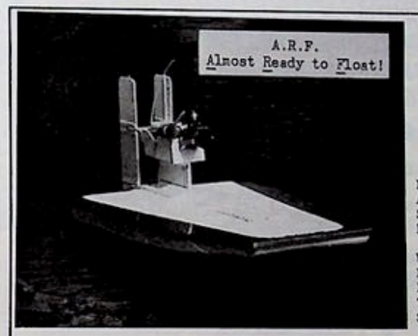

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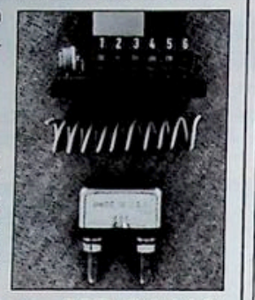

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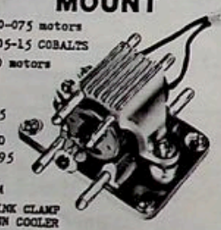

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slightly different manner from a deep vee with the propeller positioned below the bottom of the boat. The CESA 1882 tended to slide through the corners when making full speed turns. This characteristic is typical of other surface piercing model deep vees I've seen run.

It would be my suggestion to have some extra battery packs charged up when going out to run the CESA 1882. Personally, I don't like to sit around waiting for batteries to charge up while I'm at the pond, so I try to bring along a bunch of batteries.

MANUFACTURER'S LISTING

Hobby Dynamics, P.O. Box 3726, Champaign, IL 61021.

PDI—Product Design Inc., ZETA speed control, 16922 N.E. 124th St., Redmond, WA 98052. •

DUMAS *Continued from page 61*

with the prop thrust angle.

I have run the "Hotshot Sprint 3.5" with both a stock K&B 3.5 Outboard and a modified 3.5 employing a 707 Specialties exhaust throttle/pressure carb. The boat really flies with the modified engine. I didn't get an officially timed run on this setup, but it had to be running in the high 40s. At those speeds, smooth water is a must. On one run with the modified engine, I blew the boat off and it seemed like it flew five or six feet into the air before making a big splash.

It will be necessary to experiment with different prop angle and depth settings to get the setting which will allow the boat to corner at full throttle. I have the lubrication holes on the lower unit of my engine 1/4 inch above the bottom running surfaces of the sponsons. The use of an adjustable motor mount is a must to achieve top performance from a tunnel boat. Du-Bro Products now has a new adjustable motor mount that appears to be a good design. I have run Octura X-440, X-442, and X-437/3 propellers on the boat. The X-442 seemed to provide the best performance.

The boat can be "flown" with a fairly positive bow high attitude for all-out speed. However, when it is floating on a cushion of air it will not respond readily to rudder control. Chopping the throttle will bring the boat off cushion so it can be turned. When setting up my tunnels for course racing, I prefer to sacrifice some straightaway speed for better handling In the turns.

For the model boater interested in building a wooden tunnel with both scale appearance and good performance, the new "Hotshot Sprint 3.5" is worth consideration.

MANUFACTURER'S LISTING

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HOBBY DYNAMICS, P.O. Box 3726, Champaign, IL 61821.

K&B MANUFACTURING, 12152 S. Woodruff, Downey, CA 90241.

OCTURA MODELS, 7351 N. Hamlin Ave., Skokie, IL 60076.

707 SPECIALITIES, Joe Monohan, 14335 Mulberry Dr., Whittler, CA 90604. •

POWER *Continued from page 63*

the running site I thought it was going to be a wasted day. The surface of the water was littered with vegetation blown off the trees surrounding the pond. Outboard tunnels just won't perform if material floating in the water wraps around the lower skeg. Looking at all the junk floating out there, I didn't see how we could make a run without snagging a bunch of that stuff. However, Dick hadn't come this far to give up without a try.

We made a few tuneup runs prior to the timing lights becoming operational and the junk in the water didn't seem to cause any problems. That was definitely a pleasant surprise. The 3.5cc Stock Tunnel record that both Dick and I were gunning for was held by my friend Rod Geraghty, at 45.76 mph. However, we weren't the only ones with "Straightline Fever" and we had to wait our turns to see "Dr. Timing Lights." During the first few opportunities to make passes through the timing lights, my times were slightly better than Dick's. I had one pass at slightly over 43 mph. We were both making adjustments to motor heights and needle-valve settings.

After three or four different opportunities on the water, Dick was becoming a little discouraged because his boat hadn't shown the performance it demonstrated two weeks earlier in Texas. Dick asked for my advice and I suggested "jacking up," or raising the motor, on its mount. Dick asked, "How far up?"

I told him, "As far up as it will go." Dick made the adjustment and the next time on the water the boat was doing 45 mph with a rich needle-valve setting. Dick brought the boat in, I leaned-in the needle-valve setting, and the boat was relaunched. Once the boat was released, everyone on the beach knew the needle setting was "perff." Dick drove the boat through the lights at 47+ mph and then backed it up with a 48+ pass. The two best back-to-back runs yielded a two-way average of 47.568 mph. It was the first model boating record Dick had ever set and the "Fever" really felt great. I was rather pleased myself.

Once Dick had established the stock record, I removed the stocker from my tunnel and bolted on my 3.5cc modified engine featuring slide exhaust throttle and pressurized fuel draw. On my second run with this setup, the boat made a pass at 49.5 mph, only a mile off the record for 3.5cc Modified Tunnel. Wow, did the "Fever" ever hit hard then. But time was running out on our permit for use of the running site. We had to be off the water by 5:00 p.m. It was crunch time and I had one last opportunity to get on the water. I "tweeked" the needle and let it go. It would be great to tell you my little tunnel streaked to a new record in 3.5cc Modified Tunnel. Such was not the case, however, as I wasn't able to get the boat over 48 mph.

We had to stop the record trials to meet the requirements of the use permit. In hindsight, I should have followed the advice I gave Dick and "jacked up" the engine. Oh well, the "Fever" will return again in late October when we have another appointment with "Dr. Timing Lights."

SILENT SPEED FEVER

While I was making noise with my powerboats at the April straightline record trials, a group of Northwest model boaters whose interest is electric racing were quietly establishing some new APBA electric speed records. And although the electric speeds weren't nearly as fast as the fuel records, one electric powered hydroplane caught the attention of many of the nitro burners in attendance.

The boat was a 22-inch "shovel nose" 3-point hydro version of the "Miss Burien" belonging to Pete Schille of Seattle. The basic hull is an ABS plastic hull from Electric Thunder Inc. The electric motor was an Astro Flight FAI 05 coupled direct

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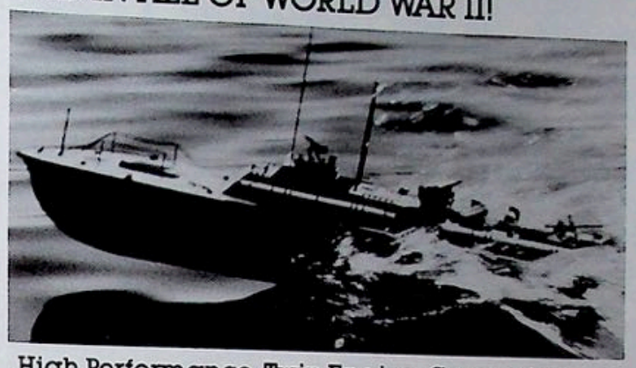

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drive to an Octura X-432. Pete established records in 6-cell Mod Hydro and 12-cell Mod Hydro. The time for the 6-cell record was 23.01 mph. It was the 12-cell record, however, that caught the attention of those attending the event. Pete made two passes through the lights for a 2-way average of 35.601 mph!

Now that is really moving for a single-motor 12-cell boat. The interesting thing is, this is just the basic racing setup Pete uses when competing in Electric Thunder events. Although the R/C Model Racing Commission doesn't presently recognize a 7-cell record, Pete's "Miss Burien" did make a 2-way average of 27.58 with a 7-cell battery pack. For speed control, Pete uses the Hydro Zeta from PDI.

With speeds like these, electric hydroplane racing is definitely going to start gaining in popularity. For the first time at any national model boat championships race, electric boats will be featured at the 1990 APBA R/C Boat Nationals in Olympia, Washington, along with the fuel powered boats. I'm planning to have a couple of "Silent Speeders" ready for the electric competition. There will be an article on the electric races appearing in our Fall or Winter issue. •

CALGARY *Continued from page 65*

Bruce Ellis, also from Calgary, proudly displayed his scratchbuilt *HMS Endeavor*.

Using plank-on-frame construction, Bruce built his ship model from plans. Maple masts, mahogany planks, and cherry planks set off the basswood deck. Everything was scratchbuilt, except for the commercial fittings.

Model boats were a major part of this hobby show. From Doug Hamilton's eighteen-foot steam powered boat out front, whistling and puffing, to the static scale models inside, model boats were featured throughout.

While I was able to get a good tour of the entire show, most of the time I helped at the CMBRA display. With more than 30 power boats on display and continuous boat racing movies shown, this display always had a crowd. Many club members fielded the same questions over and over again. "How fast does it go?" "How much did it cost?" "Did you build it yourself?" "Where can I get one like this?"

These questions prove just how much interest model boats can generate. CMBRA club members were quick to point out their own boats on display and as they were featured in the racing movies. Everything from Doug Sick's APBA Nats trophy-winning 40 Spider to the brand new Steve Muck kit, *Mr. Pringle's* scale hydro, drew admiring visitors.

I had never attended a large hobby show before. To say that the Calgary Model Exposition is exciting is an understatement. It is also a lot of fun to meet other modelers and see their projects firsthand. I do plan to attend many more. I encourage you to take the time to go to one of these shows. At the very least you will get to see some spectacular models. But even better, is the fine people you will meet and the excellent ideas and tips they can give you. •

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STORE *Continued from page 55*

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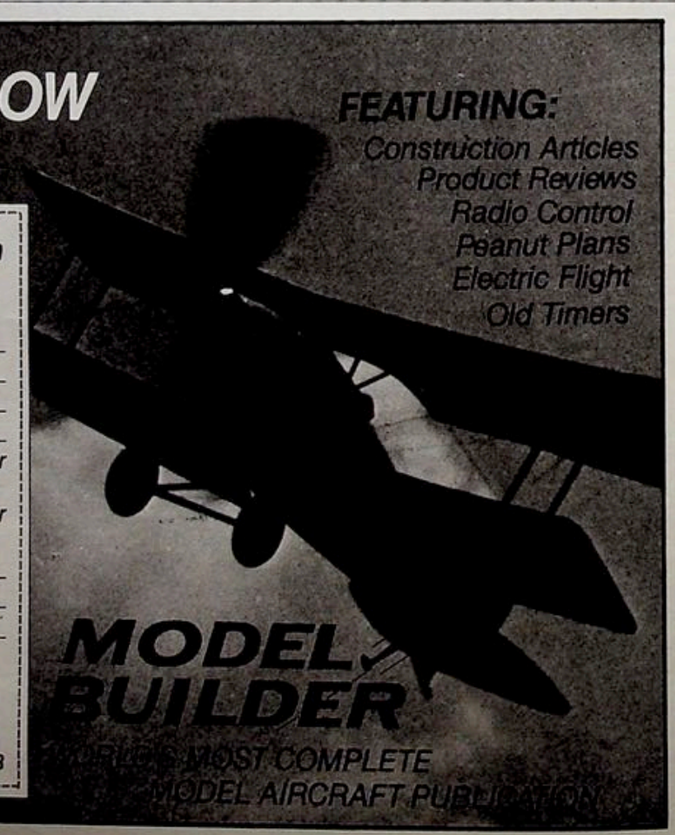

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boat to join the Prather Products stable of race-winning designs. Outrigger hydros are the fastest class of model boats available, and Prather Products has taken this class of boat to a new level with the Spitfire I (for K&B 3.5cc Outboards). The prototype has already set a new national straightaway record of over 60 mph, plus a new oval course record.

The Spitfire I features a unique, one-piece epoxy-fiberglass hull, with sponsons factory joined to the hull with aluminum tubes molded inside. The sponson angles are factory set to insure accurate, stable performance. A streamlined epoxy-fiberglass cowl covers the rear tank area to provide aerodynamic efficiency and protection of the engine and tank from water spray. An epoxy-fiberglass hatch covers the radio compartment which is formed by the center of the hull. Radio mounting hardware, including servo mounts, are provided.

Construction of the Spitfire I is made easier with the availability of an accessory kit, which includes a boat stand kit, adjustable outboard motor mount, steering and throttle cable set, stainless steel prop, fuel line, antenna, fuel tank, radio switch mount, and clear plastic tape to seal the radio hatch cover.

The real finishing touch for the Spitfire I, and any K&B 3.5cc Outboard-powered boat for that matter, is the Mod Engine Kit for the K&B 3.5 Outboard. Anyone who has followed the superfast sport of Formula I R/C Aircraft Pylon Racing may remember that some years ago, Terry Prather was a top performer in this 150 mph sport, winning many major events locally in California, as well as nationally. It not only takes flying skill and lightning coordination, but also an extremely fast and dependable engine to put out maximum power for the minute and fifteen or so seconds that it takes to fly ten laps of the pylon course. Terry then, and now, produces carefully modified engines for leading pylon racers. So it goes without saying that he knows where he's coming from in offering a modification kit for the K&B that will add 10 to 15 mph to the speed of the Spitfire I and many other boats designed for this outboard.

The Mod Engine Kit will require some drilling, grinding, and filing on the engine. No piston and sleeve modification is required. The kit includes an exhaust throttle, hi-performance needle valve assembly, pressure fitting, and stainless steel rudder. Complete, step-by-step instructions, along with 30 photos, are included. Even a novice can do the job with the instructions and a few basic hand tools. The following five operations briefly describe the modifications.

1. The carburetor is removed from the engine case and a hi-speed needle valve assembly is installed directly in the case. The case opening allows several times the volume of air/fuel mixture to enter the engine.

2. A pressure fitting is installed in the side of the engine case, which pressurizes the fuel tank with several times the pressure of the stock exhaust pressure. This pressure delivers a good fuel flow to the large diameter opening in the case.

3. An exhaust throttle is installed to replace the stock exhaust adapter. As no carburetor is used, the exhaust throttle is used to regulate engine speed.

4. The stock skeg on the lower unit is removed and a stainless steel rudder is installed. The new rudder is needed to add stability because of the tremendous speed and rpm increase. The new rudder is longer and thinner than the stock skeg, and offset to the right for added stability.

5. The exhaust path must be carefully filed or ground out and the baffles near the end removed. The improved exhaust path allows improved exhaust flow for more rpm and power.

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Black Diamond Boats	60
Dagger Boat Works	75
Dumas Products, Inc.	cover 2
Dynamic Models	39
Eastern Tool & Supply Co.	56
Edger	50
Evergreen Model Boats	68
G.P. Marine	58,59
Hartman Fiberglass	R/C 72
Hayes Products	80
Hobby Dynamics Distributors	20,38,51
Hobby House	67
Hy-Tech	74
IMS Milwaukee	4
Internationla Hobbies	73
International Hobby Corp.	70
J'Tec	74
K&S Engineering	74
Kyosho	44,45
M.A.C.K. Products Model Marine	75
Model Builder Subscriptions	78
Model Rectifier Corp. (MRC)	cover 4
Northeastern Scale Models, Inc.	9
Octura Models	56,71
Parma International	68
Pop Up Manufacturing Co.	69
Porta-Power Industries	74
Prather Products	50
R/C Buyer's Guide	66
Radio Controlled Models (RAM)	72
Robbe Model Sport	1
Robinaire	73
Skunkworks Manufacturing	70
Taubman Plans Service Intl.	70
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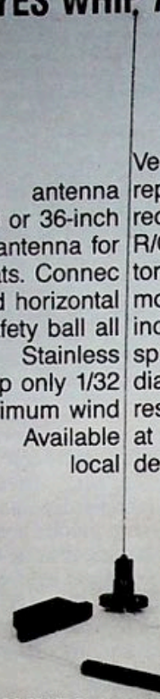

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First there is the "Eco-Star," designed by K. Krischik, world champion in the FSRE and 1 Kg electric boat classes. This boat, 18 inches long, is very maneuverable, and self-righting. Kit features a molded ABS hull and deck, motor, drive line, water cooling, rudder system, battery tray, propeller, whip antenna, and colorful decals.

Next there is the sleek, 22.4-inch long "Komet." Kit includes molded hull, deck, cockpit, fittings, powerful Navy outdrive with an EM540 motor, and high-pitch surface prop. Colorful decals make painting unnecessary.

The Robbe "Unlimited" is a brute-sized electric, with a length of 32.7 inches, a beam of 15 inches, and a height of 9 inches. A semi-scale model of a typical turbine engine-powered Thunderboat, the kit features molded hull components for fast building, two EF 76 II motors that link to one surface drive, and a stepped speed switch. It runs on two six or seven-cell batteries, not supplied. Colorful decals make painting unnecessary.

The "Sea-Wolf" submarine should keep all the little kids out of the pool so you can get to use it! Adjusted for neutral buoyancy, the Sea-Wolf will submerge when the speed is increased enough for the front dive planes to force it under. They are controlled by a mechanical depth regulator in the two-channel radio version, which needs only throttle and rudder control. With three channels, you can have your own control of the dive planes, and get into REAL trouble! The length is 34.4 inches, beam is four inches, and the weight is nine pounds.

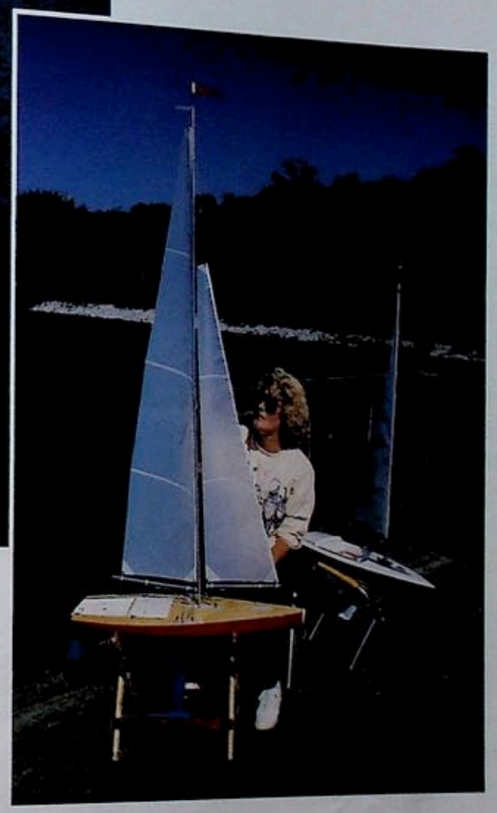
Hobie Alter, designer and manufacturer of the famous Hobie Cat, should get a real kick out of the Robbe "Top Cat." (Gee, they shoulda named it the "Robbe Cat!") This Hobie Cat look-a-like R/C sailing catamaran can easily outrun the same size mono-hull sailboat. Because of the rotatable mast and slatted main sail, the sail setting is aerodynamically perfect, so that even in light winds, the Top Cat can reach tremendous speeds. Using the anti-capsize pendulum, it may be sailed on only one hull, even in freshing winds. The pendulum keel will even right the cat if you overdo it (which is pretty normal for these speedsters). The jib and main are controlled by a single winch, so that only a two-channel surface radio is required for operation. Length is 54 inches, height is 86 inches, and the weight is 8.36 pounds. Gotta have one of these! •

A Competitive 1-Meter Sailboat for Racing!

Miramare's ***fast sailing speeds*** *may shock you!*

GR2116 Graupner
"Miramare"
1-Meter Sailboat
$289.00
List price $385.00

Modelers who have sailed Miramare have told us that they are astounded: **Miramare slips through the water at speeds that seem impossible for a sailboat.** The high aspect ratio (that is; tall and narrow) sails find any breeze and translate it instantly to **forward motion.** To minimize drag the ready-made keel is thin and knife sharp. To keep the center of gravity as far below the hull as possible, the keel weight is in a bomb-shaped lead weight at the very end of the keel. To keep the topside weight low the deck is lightly constructed using thin aircraft plywood, balsa, and light plywood braces. The hull is preformed ABS. The keel and rudder are solid injection molded resilient plastic with the necessary mounting rods molded in. The mast and fittings are made of machined brass and aluminum. The rigging allows Miramare's mast to be perfectly trimmed (bent, swept, moved fore or aft) for any wind conditions.
Included in our price for Miramare are all the fittings, rigging parts, and keel weight that are sold separately in Europe for over $90.00!
A sailwinch servo is needed. Order GR3771. There is an optional Cabin and Rail Set available (GR577 — $29.80) for those who would like to make Miramare look less like a 12 Meter racing yacht and a bit more like a day sailer. This is a decorative set only and does not increase performance.



Hull Length:	Beam:	Mast Height:	Sail Area:	Weight:	Controls required:
39" (1 Meter)	9-5/8"	64"	603 sq. in.	8-1/2 lbs.	Rudder, Sailwinch

A powerful ***SAILWINCH SERVO*** *for RC sailboats.*

GR3771 HL/Graupner **Sailwinch Servo** **$124.00**
List price $164.95

4" long, self-locking gearbox holds the sail at any position. You can run the winch in either direction to let out or trim in the sail to any position you want it.
You will have to attach your own servo connector plug to work with your radio (it comes with a connector for JR radios). The sailwinch servo can operate off of a separate battery pack of from 4 to 9 volts, or you can operate it off your 4.8 volt receiver battery.

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MRC's New Excalibur 40 Hawk gives you all the right reasons for getting into R/C power boating.

IF YOU'VE CONSIDERED R/C POWER BOATING BUT WERE WAITING FOR THE PERFECT BOAT KIT. . .THIS IS IT.

Based on the 40' Wellcraft classic deep vee, this new MRC craft is magnificently detailed and totally realistic.

From the deck hardware to the instrument panel, all the details are accurately recreated in the Hawk, using authentically precise decals and quality chromed fittings.

And under it all is a rugged hull molded in tough ABS plastic, so it's as tough as it is beautiful.

POWER FOR THE POWERBOAT

True to the original, our 1:18 scale Hawk is a real performer.

Among its many **standard** features is a powerful RS-540 Mabuchi electric motor. So the Hawk can not only attain high speeds, but perform in rough water. And like the full-size boat, this one has the power and deep vee design to turn on a dime and accelerate with lightning speed.

Its light weight (2 lb., 6 oz.), combined with a 3:1 easy to assemble gear box, not only improves performance, but offers extended running time and delivers efficient operation in both forward and reverse speeds. A forward and reverse speed control means optimal responsiveness. What's more, you get a choice of props: one for high speed operation, the other for extended cruises.

IT'S EASY TO GET STARTED

All running hardware including motor and gearbox is included in the kit. In addition, there's an easy to follow step-by-step instruction booklet with plenty of illustrations to make assembly simple. It shouldn't take more than a few hours to go from package to pond.

So visit your hobby dealer and ask to see MRC's all new, Wellcraft Excalibur 40 Hawk Deep Vee. Fast, fun, and easy; it's one of the best reasons yet for getting into R/C boating now.

FUN, FAST, AND EASY.

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